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THE SERUM TREATMENT OF PURULENT PROCESSES[1]

BY DR. EMERICH GERGÖ, BUDAPEST, HUNGARY

Assistant to the First Surgical University Clinic at Budapest. (Director: Hofrat Professor Julius Dollinger)

UPON the advice of my chief, Hofrat Prof. Dollinger, I undertook, some time ago, to investigate the practical value of the antiferment treatment. One hundred and sixty carefully observed cases form the basis for my communication.

Because of the limited time, I must here omit the details of the methods of application of the treatment. I take it for granted that the technique of the procedure, whether by puncture, serum irrigation, or serum packs, etc., is known to all, and I will present only the important facts of my work as briefly as possible.

I will first present my clinical observations.

I

ABSCESSES OF THE SOFT PARTS

A. *Favorable aspects of the treatment.*

In the treatment of abscesses of the soft parts (128 cases), "the domain of antiferment treatment," as Müller has said, I was able to observe the following advantages.

1. *The manner* of the procedure is very simple and can be done in a very short time (4 to 5 minutes).

The seat of operation is painted with tincture of iodine, thereby accomplishing the sterilization preparation of the patient in a few seconds. Instead of opening the abscess by a large incision it is simply punctured with a strong aspirating needle and the contents aspirated with a syringe. Repeated injections and aspirations of the abscess cavity with serum are then made, thereby thinning the thick pus and allowing a more thorough cleansing. The abscess cavity is then injected with clean serum — a quantity amounting to about one-third to one-half as much as the aspirated pus. The point of puncture is then covered with gauze and adhesive plaster. Only in the more severe acute processes is a Burrow's hot pack indicated.

2. *The healing* of the abscess proceeds rapidly and definitely. To this there is one exception, however, and that is in the large deep-seated abscesses. (See indications later.)

The patient's pain subsides, as a rule, immediately after the puncture. The fever abates. The signs of inflammation, œdema, the accompanying lymphangitis, etc., have usually subsided by the next day, and occasionally have disappeared altogether.[2]

Internal healing of the abscess accompanies the improvement of these external signs. The suppurative process ceases, the dead tissues separate and are either aspirated (after they have been diluted with serum) at the time of the next puncture, or they spontaneously evacuate through a fistula later on. The content of the abscess remains cloudy or bloody for one to two days. After this time it is

[2] As a ferment serum I used sterile, generally "hochwertige," ascitic fluid, more seldom hydrocele fluid, and lately Merck's leucofermantin.

[1] Read in the Seventh Surgical Section of the International Medical Congress at Budapest, August 28 to September 4, 1909. Authorized translation from the German through J. B. Murphy, M. D., by Lawrence L. Iseman, M. D., Chicago, Illinois.

usually a clear, clean serum in the smaller abscesses, but in the larger ones it does not become clear until after repeated aspirations. The clear serum is sterile, as is shown by bacteriological examination.

The few leucocytes which can be found microscopically in the serum show an increased phagocytic power.

3. *The after treatment* was apparently simple. The repeated, more or less painful, changing of dressings which is required after the incision method is avoided. It is necessary to see the patient only once or twice.

In over one-half of my cases I accomplished my result with but a single puncture. In one-third of the cases a second puncture was required, and in the largest (with over 100 cc. of pus) abscesses only was I compelled to puncture three to five times.

4. *The duration of the treatment* in most cases was a comparatively short time when one considers the methods formerly used. The duration bore a direct relationship to the size of the abscess, i. e., to the quantity of pus aspirated.

The duration of the treatment in abscesses containing:

1 to 5 cc. of pus was on the average of 3 days.
5 to 10 cc. of pus was on the average of 4 days.
10 to 15 cc. of pus was on the average of 5 days.
15 to 20 cc. of pus was on the average of 10 days.
20 to 25 cc. of pus was on the average of 11 days.
50 cc. — 1½ litres was on the average of 8 days to 5 weeks.

It is therefore evident that the duration of treatment, at least in the small and smallest (those containing 1 to 5 cc. of pus) abscesses was definitely shortened. In the larger (containing 2 to 15 cc. pus) the duration of the treatment was not so pleasing; while in the largest (with 50, 100 and more cc. pus) the treatment lasted as long as the former methods. We must present these points as well founded before we can outline the exact indications for the antiferment treatment.

In this connection a few words concerning the *duration of the healing process* may suffice. At all events this time is shortened, notwithstanding the fact that in our closed method the exact moment of anatomical healing cannot be determined with certainty because of the overlying tissue. The subsiding of the clinical manifestations is no satisfactory criterion as to the exact condition of the interior of the pus cavity. My opinion is that in most cases an anatomical healing has not yet taken place at the termination of the treatment. Such is possible only some days later.

As one advantage of the closed method of treatment one might mention that most of the cases can attend to their accustomed duties during the whole course of their treatment without any fear of aggravating their disease, and, what is more, at the cessation of the treatments they can await the complete restitution of function without medical assistance. A continued medical control is necessary only so long as local inflammatory signs (fever, rapid pulse, etc.) are present.

Healing is not influenced one way or the other by the species of the bacterial invader present: staphylococcus, streptococcus, diplococcus, colon b., etc.

5. *The cosmetic result* is excellent. In the female sex especially, and particularly with the abscesses of the face and neck, the avoidance of the disfiguring scar cannot be too strongly emphasized.

Anyone who has been witness to the fact that abscesses in this region (size of a plum and even larger) disappear at once with a single treatment and without any external signs of any interference, will more reluctantly dispense with this method in this class of cases.

6. *The functional result* is better — and this is true for two reasons:

a. Because in the puncture treatment the scar formation, which follows the incision method, and eventually the scar disfigurement, is avoided.

b. Because the injected antiferment, through its physiological action, does not permit a further progress of the purulent softening which would lead to a larger spreading scar formation.

Almost all my cases healed ideally without scar formation under the antiferment treatment.

B. *Unfavorable aspects of the treatment.*

As disadvantages of the method I observed:

a. Immediately after the treatment:

1. *Pain* in the region of the abscess. This

can be prevented if one omits the addition of an irritating preservative to the antiferment solution, and also if overdistention of the abscess by an over quantity of serum is avoided.

2. *Headache and dizziness* I observed only once. These symptoms disappeared in twenty-four hours.[1]

3. *Chills* immediately after the treatment I observed in three cases. Usually the chills made their appearance several hours after the puncture. The next day this condition was normal.

4. *Acceleration of the pulse;* observed once and continued throughout the treatment.

b. Unfavorable aspects later in the course of treatment:

1. *Fistulous formation* at site of puncture. Such occurred in one-fourth of the cases, generally several days (usually four) after the puncture.

The formation of a fistula was never followed by a change in the usual course. All fistulæ closed spontaneously — usually within a week.

2. *Extension* or spreading of the abscess. In spite of every care in technique in applying the antiferment this occurred once — in an old decrepit patient with an abscess as large as a child's head on the back of his neck.

3. *Retarded absorption* of the injected serum. This takes place only when too large a quantity of serum is injected into the abscess cavity. In a case with such a complication arising one should simply aspirate the retained serum; but it should be remembered that a too early aspiration of the retained serum may lead to relapse.

In such a case it is indicated to thoroughly cleanse the abscess cavity and then inject a smaller amount of serum, rather than to fill it with too large a quantity.

4. *Pigmentation* of the skin over the abscess was observed in two cases.

5. Large local scar formation, in abscesses treated with antiferment, I observed once.

These latter two complications were still present several months after the treatment.

If these harmless complications are disregarded, then I was never able to observe any directly harmful effects from the antiferment treatment.

II

INFILTRATING SUPPURATIONS

In infiltrating suppurations or more diffuse inflammations, e.g., felon, phlegmon, carbuncle, diffuse phlegmonous mastitis, etc. (16 cases) I observed that a healing in such cases can be accomplished only after the infiltrating process has gone on to a well circumscribed abscess.

Otherwise, the only value of the method in these cases lies in the fact that wherever the serum comes in intimate contact with the wound,[2] the secretion ceases, the exudate and necrotic tissue become separated within a few days and the wound soon becomes clean.

The progressive course of infiltrating processes is not influenced by the serum treatment.

III

BONE SUPPURATIONS (4 cases)

In these four cases of bone suppurations the laying open of the bone focus followed by many weeks of progressive treatment with serum irrigations, serum packs, or serum injections resulted in nothing more than a cleansing of the soft parts of the wound. The process in the bone continued in spite of all this and we were after all finally compelled to adopt a radical procedure.

IV

BONE FISTULÆ (5 cases)

Bone fistulæ are subject to the same criticisms as bone suppurations.

V

FISTULÆ OF THE SOFT PARTS (7 cases)

These fistulæ, especially when they were large and superficial and therefore suitable for serum tamponade, soon showed a narrowing, a diminution of their discharge and a filling of the fistula with clean granulations.

The fact that the method fails in infiltrating and bone suppurations finds a natural cause

[1] Serum-exanthem and the symptoms of anaphylaxis, which will be mentioned later, I never observed after the antiferment treatment.

[2] In these cases a preliminary incision is followed by serum irrigations and application of serum packs.

in the theoretical principles which my colleague Müller has previously set forth. The antiferment serum can be effective only where it is brought into most intimate contact, on all sides, with the suppurating surface of the wound (Müller), where, in short, the antiferment chemically binds itself, by direct contact, to the proteolytic leucocyte ferment. It is not difficult to see, therefore, that certain physical conditions hinder this preliminary requisite for an effectual antiferment treatment in infiltrating and bone suppurations.

INDICATIONS FOR THE ANTIFERMENT TREATMENT

If I may draw conclusions from the above briefly quoted observations as to the exact field for the employment of the antiferment treatment I would arrange the special indications in the following order:

1. Antiferment treatment is indicated in the management of *acute abscesses of the soft parts* — with the exception of the following cases:

a. Extremely large, rapidly spreading abscesses. In abscesses containing 50, 100 and more cc. of pus we gain nothing as to the duration of the treatment, to say nothing of the trouble and expense.

b. Deep-seated abscesses. The primary focus of such abscesses is very often uncertain and cannot always be definitely determined from the clinical symptoms. Our surgical procedure is then of value only when we are certain of the original focus. The non-observance of this golden rule may lead to unpleasant surprises. I recall one case, which came for treatment, with outspoken symptoms of osteomyelitis of the thigh (femur); the suppurative process terminated in the formation of a paranephritis without any local symptoms.

c. Extreme weakness on the part of the patients. Here we dare not waste time with antiferment treatment. In the very decrepit, old persons especially, if the abscess is quite large, a rapid free incision is indicated.

d. Inflammatory tuberculous abscesses are much more easily managed by incision.

In all other cases of acute abscesses of the soft parts the antiferment treatment is a valuable and excellent ambulatory treatment.

2. In infiltrating suppurative processes the antiferment treatment is indicated only after the original diffuse process has become a well circumscribed suppuration, i. e., an abscess.

In all other cases of infiltrating suppurations the antiferment treatment is of no avail inasmuch as it does not check the progress of the inflammatory process..

3. The treatment is indicated in the management of fistulæ of the soft parts. It causes the discharge to diminish, the fistulæ fill up with clean granulations, and the subjective symptoms improve.

EXTENSION OF THE ANTIFERMENT TREATMENT ALONG OTHER LINES IN SURGERY AND RELATED BRANCHES OF MEDICINE

By carefully adhering to the above line of indications antiferment treatment can be extended along various lines in surgery.

Besides applying this new treatment in subcutaneous abscesses, lymph gland abscesses and breast abscesses, I gave it a trial in other special lines of surgery.

It gave favorable results in: abscesses of the tongue — 2 cases; inflammations of the gums — 4 cases; buboes — 6 cases; pararectal abscesses — 3 cases; peritonsillar abscesses — 8 cases; etc.

Kolatzek (Tübingen) showed recently (XXXVIII Kongress der Deutschen Gesell. für Chir., Berlin, 1909) that in suppurations of the internal organs this new method is applicable to some of the cases only. A number of cases came up for consideration — suppurations of the body cavities (meningitis, pyothorax, pericarditis purulenta, peritonitis purulenta), suppurations of the gastrointestinal tract, suppurative arthritis, purulent inflammations of the urinary tract, etc. I regret that my limited experience in these cases does not warrant me in submitting an opinion. I can only emphasize the words of Müller when he said: "It is necessary to have the consensus of results of many observers before we can conclude as to the favorable and unfavorable aspects of the antiferment treatment."

Moreover, researches on the application of antiferment treatment in other branches of medicine are not wanting.

Lenz (Breslau) gave the method a trial in diseases of the eye; A. Fuchs (Breslau) reported favorable results in gynecology. My results with abscesses of the tongue, inflammation of the gums, peritonsillar abscesses, and buboes speak favorably, at least, for the application of the method along the lines of stomatology, laryngology, and urology.

EXPERIMENTS TO SUBSTITUTE SOME OTHER REMEDY FOR THE ANTIFERMENT PROCEDURE

A further question of a *practical* significance is whether or not it is possible to advantageously substitute some other remedy for the antiferment treatment, and other solutions for antiferment sera.

A simple puncture of the abscess is practicable only in very small abscesses (1 to 2 cc. of pus) and even then it is not always effectual.

Physiological salt solutions (0.9 per cent) do more harm than good. Injection of large quantities often causes an increase of all the inflammatory phenomena.

In using the salt solution I obtained better results when I added a very small quantity (0.001 to 0.01 per cent) of calcium chloride to the salt solution — a fact for which Hamburger and Hekma found a theoretical reason. They observed that the addition of small quantities of calcium ions to physiological salt solutions stimulates phagocytosis.

It also seems plausible that the addition of calcium to physiological salt sol. removes the toxic effect of the sodium chloride upon the cells (Loeb).

Injection of animal sera (horse serum, cow serum) is accompanied by very severe reactionary phenomena. With these symptoms appears a hyperleucocytosis and an increased phagocytic defense — as has been shown by the extensive researches of Fejes (Budapest).

I used animal sera in experimenting on over 100 cases of purulent processes, and I succeeded finally in determining the dosage of the animal serum in order to get the desired clinical effect. A simple cleansing of the abscess cavity suffices to call forth a sufficient leucocytosis to affect the healing and still prevent the severe reactionary symptoms of larger quantities.

If one wishes to have a more marked inflammatory reaction he needs only to inject a few cc. (1 to 5) of animal serum into the abscess cavity. Such larger doses of animal sera were used in the treatment of tuberculous processes.

The physiological treatment of suppurating processes is not a new procedure in surgery. Only recently von Mickulicz adopted it in his nucleic acid treatment, and Bier in his hyperæmia treatment. These methods are closely related to the antiferment serum procedure of Müller, Kolaczek and Preisser. The treatment of suppurating processes with physiological solutions and animal sera, of which I have previously made mention, also belongs to this same procedure.

All these various methods are after all identical. They do not imitate the physiological defense in every particular but only in one or another important phenomenon. They must necessarily be so, for the present at least.

An effectual, ideal method for all surgical suppurations has not yet been found, and there will not be any such method — until our present knowledge of the defensive mechanism of the organism is enlightened; until the minutest details of the process of defense against infection is thoroughly understood; nor so long as we do not, in short, fully understand the complicated mechanism of physiological defense in all its phases.

Only upon such a basis will we be in a position to effectively aid the natural healing mechanism in all surgical infections.

This would be an ideal physiological management. For the present it is only a prospection, for such a procedure can be built up only upon the basis of most extensive researches on physiological wound treatment.

Our course appears therefore to be the correct one. To our honorable colleague, Dr. Eduard Müller, belongs the honor of introducing this new procedure.

THE PRODUCTION OF SHOCK BY ELECTRIC STIMULATION OF THE ABDOMINAL SYMPATHETIC GANGLIA

An Experimental Study

By E. B. FOWLER, M. D. and R. M. PARKER, M. D., Chicago, Illinois

IN this preliminary report it is not our intention to attempt more than to state briefly some of the views held with reference to shock, and to report our work in this field.

Fischer some two score years ago gave a classical description of shock ("traumatic shock" so-called) produced suddenly by a blow on the abdomen. Traves was perhaps the first to picture for us what has been called, for lack of a better term, surgical shock, a condition seen during or after a surgical operation with a more gradual onset than the case described by Fischer. Fischer's case might possibly have been called by Crile one of collapse, for he hold that shock is caused by stimulation of the vasomotor center to the point of exhaustion, which is the cause of failure of blood pressure and this failure brings about the clinical picture known as shock. Crile makes a distinction between shock and collapse. He holds that the onset of shock is slow, collapse is sudden; shock is not amenable to stimulation, collapse is; the vasomotor center in shock is exhausted, in collapse it is not. On the contrary Buerger and Churchman seem to use the terms shock and collapse as representing the same thing.

W. H. Howells considers shock is due to inhibition of the vagus and vasomotor centers of the medulla. S. J. Meltzer does not agree with Crile's vasomotor exhaustion conclusions but he believes that shock is produced by stimulation of the various inhibitory nervous mechanisms giving a state of inhibition but not exhaustion. However we are not sure that there is any great difference in the experimental results obtained by Crile and Meltzer but perhaps only a difference in standard as to when shock can be said to exist. Meltzer, Buerger, Churchman, Howells, many surgeons and others, would, we believe, consider a state of shock existed at a time when Crile would hold that it was not yet fully established.

March, 1907, Surgery, Gynecology and Obstetrics published the report of an experimental study by Buerger and Churchman entitled "The Coeliac and Mesenteric Plexuses and their Role in Abdominal Shock."

Searching for an answer to the question, "What is the role, if any, of the abdominal sympathetic in abdominal shock?" these authors decided that collapse or shock can not be produced in warm blooded animals by irritation of the abdominal sympathetic ganglia. The chief aim of their work was to determine under what circumstances it is possible to cause a condition of shock or collapse by irritation of the abdominal sympathetic ganglia. After inducing a moderate degree of peritonitis in dogs by injecting turpentine into the peritoneal cavity, Buerger and Churchman found that the animals would succumb to shock when their mesenteric and coeliac ganglia were stimulated with a moderately strong electric current. At the same time control animals invariably lived when they were subjected either to the electric stimulation or to the peritonitis.

These investigators concluded "that the stimulation of the ganglia was in some way or other responsible for the palsy of the higher centers in the medulla," and they thought it probable "that the continued irritation of the nerve centers, by way of the sympathetic, gradually produced a condition of exhaustion incompatible with a continuance of their function." The authors felt that the extent of their work did not warrant more definite conclusions than this, and they suggested further experimentation along this line.

The question arose with us, "Are there not insults to the animal organism other than peritonitis, which will so sensitize the nervous system that, when further stimulated through the abdominal sympathetic by an otherwise harmless electric current, its function will be destroyed?" An answer to this question has been the aim of the following experiments.

As our technique varies somewhat from that of Buerger and Churchman we will state briefly our procedure. Ether anæsthesia was used. A preliminary dose of morphine gr. ⅓ to gr. ⅔ was given hypodermatically. The abdomen was shaved, scrubbed with turpentine, soap, and water and then with 2 per cent compound cresol solution. The incision, 3 to 4 inches long, was an inch to the left of the median line, parallel to the rectus and began posterior to the costal arch. A speculum which we devised was of great aid in maintaining a free field while we manipulated the ganglia. It consists of a hollow cylinder 5 inches long, 3 inches in diameter at one end, and 1½ inches at the other. The speculum was improvised from common sheet tin.

The ganglion was first isolated, the viscera held aside by fingers or retractors, and the small end of our speculum was pushed down to the posterior abdominal wall and placed so as to bring the ganglion in the center of the field. The retractors were then removed while the speculum was held in place by slight pressure on the rim. This gave three free hands with which to manipulate electrodes and other instruments.

Aided by the anatomical description of Buerger and Churchman we readily found the ganglia. Contrary to their procedure, however, we found, in nearly all of our animals, the superior mesenteric ganglion more accessible from the left side of the mesentery than from the right.

Our experiments, numbering 29, were performed in the laboratory of Northwestern University Medical School. The early experiments were not uniform in procedure but they were of value in perfecting our technique and in suggesting the lines to be followed later. They are here given in brief for the sake of completeness.

No. 1. Weight 15 pounds. Right and left coeliac and the superior mesenteric ganglia dissected out. Dog was killed immediately for purpose of study.

No. 2. Weight 17 pounds. The three ganglia isolated. Left coeliac and superior mesenteric stimulated with 20 miliamperes for 15 minutes, right coeliac 5 minutes. Dog died during night from shock. Room cold.

No. 3. Weight 25½ pounds. Left coeliac and superior mesenteric found with difficulty on account of distention of stomach and bowels with gas. A small vein between the ganglia was wounded, and hæmorrhage was troublesome. Intestines were much mauled and exposed. Room very cold, far below 50°. Dog died within 24 hours. Much blood found in peritoneal cavity. Cause of death, hæmorrhage and shock.

No. 4. Weight 20 pounds. Intestines much mauled in finding right coeliac ganglion which was stimulated 5 minutes with 20 miliamperes. Left coeliac and superior mesenteric each stimulated 7 minutes with 40 miliamperes. Room temperature low, below 50°. Dog died within 24 hours from shock.

No. 5. Weight 19½ pounds. Left coeliac superior mesenteric and right coeliac stimulated 5, 8, and 6 minutes respectively with 20 miliamperes. Intestines much manipulated and exposed. Room cold, about 50°. Time 1 hour 40 minutes. Dog died within 10 hours from shock.

No. 6. Weight 27½ pounds. Left coeliac and superior mesenteric each stimulated 6 minutes with 20 miliamperes. Right coeliac not found. Time 1 hour 40 minutes. Room 50° or below. Dog made good recovery, and was well 10 days later.

No. 7. Weight 17 pounds. Right and left coeliac and superior mesenteric ganglia each stimulated 10 minutes with 20 miliamperes. Ether anæsthetic 50 minutes. Chloroform for rest of operation. Time 1 hour 10 minutes. But little effort to find ganglia. Room temperature 70°. Animal lived 52 hours. No hæmorrhage infection or pneumonia found at autopsy. Cause of death not ascertained.

No. 8. Weight 17 pounds. The three ganglia each galvanized 10 minutes with 20 miliamperes. Time 55 minutes. Room temperature 70°. Dog died 9 days later from bilateral empyema.

No. 9. Weight 14 pounds. Each ganglia stimulated 10 minutes with 20 miliamperes. Intestines manipulated violently and exposed throughout operation. Time 1 hour 15 minutes. Temperature 70°. Dog died on 4th day from wound infection and general peritonitis.

Our first six experiments were done through the coldest spell of the winter. The operating room was on the top floor where there was an unobstructed sweep of the wind, and as we worked in the morning before the building could be thoroughly heated, the room temperature was very low. During the first six operations no record of the temperature was made as we were not thinking of the effect of the cold on our subject. We believe an estimate of 50°, or below, conservative.

It will be seen on reading the protocol that dogs 2, 3, 4, and 5 died promptly after the operation, at least within 48 hours. In absence of any other cause of death discoverable at autopsy, we feel justified in assuming that they died from the shock of the procedure.

Inasmuch as Buerger and Churchman found that dogs lived with the same stimulation of the sympathetic ganglia that killed these four dogs it occurred to us that the low temperature might be responsible for the death of our animals. To test this theory we performed experiments 6 to 9. We followed as nearly as possible the technique of the four preceding. In some of them we purposely manipulated the intestines violently and exposed them in order to imitate our unskilled efforts of the earlier operations. Conditions appeared to us no more favorable to the animals save in one respect, a higher room temperature. Yet in these experiments, 6 to 9, inclusive, the dogs survived the first 48 hours succeeding the operation, and, if they succumbed at all, it was from some complication other than shock.

The climatic conditions did not permit us to experiment further in a cold room so we attempted to chill the animals artificially as follows.

No. 10. Weight 11¾. Small intestines exposed and sprayed with ether for three minutes. Compressed air tank used. Pressure 18 to 20 lbs. Atomizer tip held 2 to 3 inches from bowels. Intestinal peristalsis quite active for a moment under the spray then remained passive. Intestines became cold to the touch, and gradually assumed a deep livid color. The veins became so congested that they stood out prominently from the mesentery and had a full tense resistance like arteries but were of a blue-black color. The arteries and capillaries were displayed in striking contrast to the veins, having a brilliant scarlet color, and they also were greatly distended. The whole picture resembled closely that seen in a cadaver, the vascular system of which has been well injected with blue and red material.

The three ganglia were now galvanized with 20 miliamperes for 10 minutes each. The intestines were left exposed throughout the operation and felt quite cold when returned to the abdomen. The animal required but little anæsthetic and before our instruments were dried he got up and staggered about the room. Time 50 minutes. Room temperature 70°. Dog died ten days later in a very emaciated condition, weight 8¾ lbs. Ate very little after operation. Cause of death not discoverable at autopsy.

No. 11. Small intestines exposed and sprayed 9 minutes with ether as in No. 10. Bowels promptly contracted to one half former caliber, darkened in color and became congested as in No. 10, but not to so marked a degree. The mesenteric arteries pulsated violently. The temperature of the bowels was well maintained in spite of the cold spray. After 4 minutes' exposure to the ether spray small hæmorrhages were noticed in the mesentery. They varied in size from a millet seed to a wax bean. After the spray was stopped the intestines returned to original caliber. Each ganglion was stimulated 10 minutes with 20 miliamperes. Time 1 hour. Room temperature 70°. Dog died at end of three days. Infection of abdominal wound and peritoneum was the cause of death.

No. 12. Weight 21½ pounds. Each ganglion stimulated 10 minutes with 20 miliamperes. Intestines exposed throughout. Ether spray to intestines 10 minutes. Peristalsis active all the time spray was applied. Before the spray was started venous stasis was present, and a few small hæmorrhages in the mesentery were noted, evidently due to manipulation. Intestines did not shrink noticeably. Before they were replaced their color brightened and the fine capillaries on the gut stood out prominently as in 10 and 11. Room temperature 75°. Time 1 hour 15 minutes. Dog lived at least 48 hours. Further history unknown.

The animals did not suffer so severely from shock when their intestines were sprayed with ether as we expected. Yet our belief in the cold operating room as a contributing factor in shock is not dispelled. It is readily appreciated that the ether spray, while producing a severe chilling, was active but a few minutes and was applied to the intestines alone, while in a cold operating room the whole surface of the body as well as the intestines was exposed to a low temperature throughout the operation.

Our next task was to determine the effect of an electric current when applied to the abdominal sympathetic ganglia of a dog after he has lost a definite amount of blood. We prepared and anæsthetized the animal in each instance as previously described. The blood was withdrawn from the mesenteric vessels just before the galvanization of the ganglia. A fair sized mesenteric artery with its veins was selected. The vessels were held taut over the finger and snipped two or three inches from the bowel with the point of a scissors, care being taken not to perforate the mesentery, an accident which allows hæmorrhage from both sides of it and makes it difficult to collect all the blood.

Before the blood was abstracted the animal was weighed, and the amount of blood to be withdrawn was computed by taking a definite per cent of the body weight.

It was usually necessary to bleed from three or four arteries before the desired amount of

blood was abstracted. After withdrawing the blood the vessels were ligated by catching the bleeding points with a hæmostatic and pulling the mesentery out like a cone. A catgut ligature was then thrown around and tied far enough from the forceps to catch both ends of artery and veins. In using this technique we never observed that the intestines suffered in nutrition.

Our first experiment of this series was to determine how great a loss of blood the animal could suffer and yet survive after each of the abdominal sympathetic ganglia was stimulated ten minutes with a 20 miliampere galvanic current.

No. 13. Weight 27¼ pounds. Four ounces blood, a trifle less than 1 per cent of body weight, withdrawn. Right and left coeliac and superior mesenteric ganglia each stimulated 10 minutes with 20 miliamperes. Time 1 hour 15 minutes. Animal survived hæmorrhage and shock dying 3 days later from suppurative peritonitis.

No. 14. Weight 12½ pounds. Blood withdrawn 3½ ounces, about 1½ per cent of body weight. Ganglia stimulated as before. Room temperature 73°. Time 1 hour 15 minutes. Dog died within 36 hours shock and hæmorrhage.

The next experiment was done as a control to the last.

No. 15. Weight 14 pounds. Blood withdrawn 3⅓ ounces; 1½ per cent body weight. Each ganglia raised on electrode and held 10 minutes but not stimulated. Room temperature 70°. Time 1 hour 15 minutes. Dog died 5 days later from peritonitis.

No. 16. Weight 14½ pounds. Blood abstracted 3¼ ounces; 1⅓ per cent body weight. Each ganglia galvanized 10 minutes. Time 1 hour 10 minutes. Room temperature 60°. Dog lived 18 days. Died from obstruction of bowels.

This animal having survived the loss of about 1⅓ per cent of body weight in blood together with stimulation of the sympathetic ganglia, the amount of blood withdrawn was increased to 2 per cent of the body weight. This proved to be the right amount for our purpose.

All the following operations were as uniform as possible. All the dogs were bled 2 per cent of the body weight. Each ganglia was elevated on an electrode. In one set of animals 20 miliamperes was applied for 10 minutes. In the other, the control set, the ganglia were elevated on the electrode in exactly the same manner and held there for the same length of time but received no current.

No. 17. Weight 12 pounds. Poorly nourished, eczema of scrotum. Blood abstracted 3¾ ounces; 2 per cent. Ganglia stimulated. Time 1 hour 10 minutes. Room temperature 84°. Dog died within 24 hours. One and a half ounces of blood found in peritoneal cavity, a ligature having slipped from a mesenteric vessel.

No. 18. Weight 19 pounds. Blood abstracted 6 ounces. Ganglia galvanized. Loops of intestine exposed during early part of operation became quite cool to the touch. Rectal temperature 91.4 toward end of operation. Room temperature 68° Dog died within 6 hours as direct result of operation.

No. 19. Weight 18 pounds. Blood withdrawn 5¾ ounces; 2 per cent. Ganglia not stimulated. Time 1 hour 10 minutes. Room temperature 70°. Rectal temperature at start 100.4; at close 98.6. Dog alive and in excellent condition 1 month later.

No. 20. Weight 22½ pounds. Blood withdrawn, 7 ounces; 2 per cent. Ganglia stimulated. Temperature of dog at end of operation 94°. Room temperature 59°. Time 1 hour 15 minutes. Dog died within 36 hours from immediate effect of operation.

No. 21. Weight 11½ pounds. Blood abstracted 3¾ ounces. Ganglia stimulated. Room temperature 70°. Time 1 hour 10 minutes. Dog died within 6 hours from immediate effects of operation.

No. 22. Weight 21½ pounds. Blood withdrawn 7 ounces; 2 per cent. Wound bled freely and good measure was certainly taken. Ganglia not stimulated. Room temperature 70°. Time 1 hour 10 minutes. Dog died at end of a week from abscess of wound and local peritonitis.

No. 23. Weight 18½ pounds. Nearly 6 ounces blood withdrawn; 2 per cent. Ganglia galvanized. Much ether necessary. Dog very restless. He revived from anæsthetic quickly and staggered about the room. Time 1 hour 10 minutes. Room temperature 70°. Animal died within 48 hours from immediate effects of operation.

No. 24. Weight 18 pounds. Blood taken 5¾ ounces. Time 1 hour 10 minutes. Room temperature 50°. Dog showed marked signs of acute anæmia after bleeding. But little anæsthetic required. One week later dog was alive and well. No further record.

No. 25. Weight 21 pounds. Blood withdrawn 6¾ ounces. Ganglia not stimulated. Time 1 hour 5 minutes. Room temperature 57°. Dog alive one week later.

No. 26. Weight 14¾ pounds. Blood taken 4¾ ounces; 2 per cent. Ganglia not stimulated. Much ether used. Time 1 hour. Room temperature 68°. Dog died fourth day from peritonitis.

No. 27. Weight 11 pounds. Blood withdrawn 3½ ounces; 2 per cent. Ganglia not stimulated. Time 1 hour 5 minutes. Room temperature 62.6°. Dog lived a week or more, no further record.

No. 28. Weight 11 pounds. Blood withdrawn 3½ ounces; 2.9 per cent. Time 1 hour 10 minutes. Circumstances arose which made it necessary for both of us to work alone in this experiment. One began the operation and the other completed it. This operation was the only one in which we did not work together.

The dog lived contrary to our expectations. He may have been exceptionally resistant to the shock and hæmorrhage, or it is not improbable that there was an error in technique.

No. 29. Weight 19½ pounds. Blood withdrawn 6¼ ounces. Ganglia stimulated. Room temperature 62.6°. Time 1 hour. Dog died within 24 hours from immediate effects of operation.

In reviewing these experiments we will omit consideration of Nos. 17 and 28, since there was plainly an error of technique in the former and strong probability of error in the latter.

In experiments 18, 20, 21, 23, and 29 the animals promptly died after 2 per cent of their body weight in blood had been withdrawn and their abdominal sympathetic ganglia had been stimulated 10 minutes with a 20 miliampere galvanic current. The autopsies showed no other cause of death than the immediate effects of the operation, i. e., hæmorrhage and shock.

In control experiments Nos. 19, 22, 24, 25, 26, and 27 each animal received exactly the same treatment except that the electric current was not turned on. Yet after all these operations the dogs lived more than two days, dying, if at all, from causes other than the immediate effects of the operations.

It is evident then from our experiments that a dog by the loss of 2 per cent of its body weight in blood is rendered susceptible to death when its abdominal sympathetic ganglia are stimulated with a 20 miliampere galvanic current. This susceptibility appears to us identical with that developed by Buerger and Churchman in their animals when they induced a turpentine peritonitis.

In explanation of the death of our animals we offer the following: A dog has a limit of endurance and when that limit is exceeded he dies. While the loss of 2 per cent of the body weight in blood is not sufficient to destroy the average dog, it so weakens him that the application of a moderate electric current to his abdominal sympathetic ganglia is sufficient to turn the balance in favor of death.

Our experience convinces us that undue manipulation of the abdominal viscera and exposure of the animal to cold during the operation makes for the same result. We believe that it is immaterial whether the method of weakening the animal is by means of peritonitis, hæmorrhage, or any kind of trauma that produces the requisite shock, and that it is immaterial whether the final and fatal shock is from an electric current applied to the abdominal ganglia, or to any other part of the body, or whether the shock is produced in any other way, the result will be fatal when the dog's limit of endurance has been reached.

Our experiments have proved that a fatal shock can be produced in dogs by stimulating the abdominal sympathetic ganglia after the animals' resistance has been reduced by abstracting blood equal to 2 per cent of the body weight.

INCONTINENCE OF URINE FOLLOWING LABOR

By G. BROWN MILLER, M. D., Washington, D. C.

FOR the first few days immediately following labor one not infrequently sees in multiparous women an involuntary escape of urine on coughing, laughing, or any straining effort where the intra-abdominal pressure is increased. Occasionally long continued or permanent incontinence occurs, and it is chiefly to this class of cases that my paper will refer.

The changes in the female urinary apparatus which allow this incontinence are chiefly of the posterior urethra and neck of the bladder. The views of different authors are somewhat at variance, however, as to the causes and pathological changes found in these cases. I will cite some of them in the following paragraphs.

Scanzoni, one of the earliest writers upon this subject (Krankheiten der Wieblichen Brüste und Harnwerkzeuge, 1859), makes about the following remarks: "More frequently than narrowing of the urethral caliber one finds dilatation. As a rule the urethræ of women who have borne children rapidly one after another and as a consequence have a marked dilatation or relaxation of the vagina, are more patulous and more dilatable than in more virginal individuals. In some cases of relaxation of the vagina with dilatation of the urethra there exists a lessened power of the sphincter muscle which remains contracted in a moderately filled bladder, but when the bladder becomes very full it may momentarily relax and allow an escape of urine."

Fritsch (Veit's Handbuch, d. Gyn., bd. 11, s. 153) explains the condition as follows: The portion of the urethra which lies in immediate contact with the pubes, i. e., its upper wall, is firmly attached to the pubic arch. Should the anterior vaginal wall with its closely attached bladder sink downward there is apt to arise a dilatation of the neck of the bladder even before a true cystocele occurs. The lower wall of the adjoining portion of the urethra is likewise pulled down and this portion of the urethra also forms a part of the bladder. The canal is thus shortened and the entire pressure of the urine falls upon the lower third of the urethra, the portion which is firmly attached to the ligamentum arcuatum. If the intra-abdominal pressure be suddenly increased the shortened urethra is not capable of withstanding the pressure of the urine and it escapes. He says that in women who are short and fat and whose abdominal cavity is shortened in room from above downward the incontinence is noticeably frequent. He thinks the reason why the malady is seen more frequently immediately after labor is that at this period the urethra and vagina are hyperæmic and œdematous, and when this condition subsides the incontinence disappears. The condition according to him is not a dilatation of the whole urethra nor is it a paralysis of the sphincter vesicæ muscle.

Kolischer (Die Erkrankungen der Weiblichen Harnrohre und Blase; s. 11) says: "Another form of retrograde dilatation of the urethra is caused by the sinking down after labor of the anterior vaginal wall with its closely attached bladder, by which the lower bladder wall and the greater portion of the upper posterior urethral wall is pulled downward while the anterior urethral wall remains fixed to the symphysis. The urethra in consequence assumes a funnel shape with the greater diameter of the funnel directed towards the bladder. Thus the most important factors in the closure of the bladder, the posterior urethra and the neck of the bladder are dilated, and a relative incontinence ensues. The patient can control the urine in the recumbent posture, but in the erect posture especially in increased intra-abdominal pressure as in coughing, laughing, etc., the orificium externum alone is not capable of withstanding the pressure of the urine."

Dudley says that this form of incontinence is always characterized by a very appreciable sagging of the urethra and neck of the bladder from the pubes, and by a dilated, sacculated appearance of the urethra. The separation of the urethra from the pubes, is he believes often caused by a crushing or tearing of it from the symphysis during parturition and

that the condition is commonly associated with more or less cystocele, laceration, and relaxation of the perineum, and subinvolution of the whole vaginal outlet.

Baldwin (Amer. Gyn. & Obst. J., N. Y., 1899, XIV, 131) in reporting three cases of incontinence says: "The urethra was not dilated in any case, but even if such a condition had existed, incontinence would not of necessity follow so long as the urethra was not loosened from its fascial attachments to pubic bone, the so-called triangular or subpubic ligament. . . . .The fascial attachments of the urethra are likely always involved more than the muscular coats of the bladder or urethra in either partial or complete incontinence." He reports two cases of multiparæ in which the affection made its appearance a number of years after the last labor; and one case of a virgin 30 years old where it apparently came as a result of obstinate constipation. In all three cases he thought that he could demonstrate the detachment of the posterior portion of the urethra from the symphysis. He quotes Skene who also believed that the ailment was due to this dislocation of the posterior or bladder portion of the urethra.

Pousson reported a case where the condition came on in a woman who had borne two children. The *whole* of the *urethra* was dilated, easily admitting the little finger.

Stoeckel (Monatschr. f. Geb. u. Gyn., 1903, XVII, 1239) reports two cases of incontinence following sloughing of the bladder walls where the mucous membrane and internal middle muscular layers of the greater portion of the bladder had been destroyed. Cystoscopic examination showed the sphincter vesicæ internus to be represented by a thin, pale red fold.

The following cases of Glas and Zuckerkandl are reported because they illustrate the views of some investigators as to the etiology of the condition and not because they were dependent upon labor. Glas saw incontinence in a maiden of 16 years. The affection began at her 12th year and Glas believed it due to some defective innervation of the detrusor and sphincter muscles. There was no organic disease of the nervous system and the urethra and genitals were normal in appearance. Zuckerkandl (Gyn. Gesellsch., Wien, 1893, II) operated upon a 54 years' old woman in whom the incontinence appeared as a result of "senile genital involution."

Olshausen in a discussion in Berlin in 1895 expressed the opinion that it is doubtful if the sphincter vesicæ muscle is really responsible for the closure of the bladder and for continence. He thought that the urethral musculature does this and that the sphincter expels the last drops of urine in micturition.

Cumston (Monatschr. f. Geb. u. Gyn., 1904, bd. XIX, 538) says that the incontinence which arises as a result of lesions occurring during labor can be divided into two classes, (1) injuries due to pressure where only a slight paralysis ensues with a temporary incontinence and (2) deep lacerations with permanent incontinence.

Several cases have been reported where incontinence has followed symphyseotomy and here the condition was probably due to trauma with œdema, etc., as the incontinence as a rule disappeared in a few weeks. One reported case, however, required an operation after the condition had persisted for several months.

It is asserted by many that the condition is apt to be a result of prolapse and cystocele, but Stoeckel who examined cystoscopically a number of cases of cystocele says that he has never seen a dilated or gaping posterior urethra among them.

Pawlik expressed his belief that the sphincter vesicæ and urethræ muscles were not essential to continence and on this based the principles of his operation.

I have seen in the last five years four cases of prolonged incontinence which were the result of labor. In my first case, a multipara, the condition had existed for nine months and had been gradually growing worse. There was no incontinence when the patient was lying down but on coughing, laughing, or walking she had no control. Her last labor four years before was difficult and instrumental. The examination showed an old laceration of the perineum with gaping vagina. There was a sagging down of the anterior vaginal wall. The uterus was low in the pelvis and retroverted. The cystoscopic examination showed the urethra considerably shorter than normal with a dilated

posterior portion which showed a tendency to stand open when a Kelly cystoscope was being withdrawn. The urethral and bladder mucosæ seemed normal.

In my second case the condition came on immediately after delivery where there was a transverse presentation. Her physicians had done a version and had made futile attempts to deliver the aftercoming head. In attempting to deliver the head the forceps had slipped and one blade had caused a deep laceration along the urethra which separated the urethra partially from the symphysis. I was finally compelled to do a craniotomy. The laceration extended from the meatus nearly to the neck of the bladder. Owing to the desperate condition of the patient immediately after delivery no attempt was made to suture the laceration along the urethra, nor of the perineum where a laceration nearly down to the sphincter ani existed.

An examination made two months after delivery showed the laceration of the perineum above mentioned. The vagina was gaping, the cervix deeply lacerated, the uterus retroverted and lower in the pelvis than normal. The urethra seemed unusually prominent; instead of being in close apposition to the under surface of the symphysis it hung, as it were, by the side in which the laceration had not taken place. "Its power of contraction is partially lost as is shown by the introduction of the cystoscope, the urethra remaining open behind it so that one could see into the bladder after the cystoscope had been almost entirely withdrawn from the urethra." (Note made at the examination.) The scar tissue alongside of the urethra was quite noticeable. The incontinence had been at first complete but the patient partially regained control of the urine until another pregnancy occurred, about five months after delivery when with the increasing size of the uterus the incontinence grew more marked. She has now, three mo ths after the delivery of her second child, a rather marked cystocele and rectocele. The urethra hangs away from the symphysis downward towards the right side. It appears about one half the usual length and the actual measurement inside its canal is 1¾ cm. The same tendency to remain open is seen upon the withdrawal of the cystoscope and the whole canal is slightly larger than normal, admitting a No. 10 speculum without difficulty.

In my third case the ailment came on after delivery of a breech presentation. There was a deep laceration of the cervix extending to the right and anteriorly along the vaginal vault. The scar was very rigid and formed a raised ridge from the cervix to the pelvic wall. The anterior vaginal wall was slightly prolapsed. The degree of incontinence was less marked in this case and the urine escaped only upon straining, coughing, etc., and the condition grew gradually better in spite of another pregnancy which occurred within six months after her first labor. The incontinence has now completely disappeared. No cystoscopic examination was made in this case.

In my fourth case the condition appeared during a second pregnancy following within three months a normal delivery in which no appreciable laceration of the perineum had occurred. The incontinence persisted throughout the pregnancy and has continued to the present time. The escape of urine occurs only when she coughs, runs, or makes some effort which causes increased intra-abdominal pressure. The pelvic examination showed a relaxed and slightly gaping vagina with a slight tendency towards cystocele.

In reading the views of a number of investigators and in studying my own cases I am convinced that there is no single constant cause for the incontinence which appears after labor. We see it in women immediately after labor when the urethra is bruised, œdematous, and swollen; its posterior portion perhaps dilated by pressure of the fœtal parts against the symphysis; its nerve supply temporarily injured, and disappearing when these conditions subside. We see it, as in one of my cases, following lacerations along the side of the urethra and can account for it here by the partial cutting off of the urethral nerve supply and by the sagging condition of this structure; it did not closely hug the under surface of the pubes and did not conform to Pawlik's idea that the anterior and posterior surfaces should lie in close contact at the point of flexure. Baldwin, Skene, and Dudley think it is due generally to dislocation of the bladder portion

of the urethra from its attachment to the under surface of the pubic arch. Stoeckel believes that cystocele and dilatation of the posterior urethra are rarely if ever coexistent and clinical experience teaches that incontinence does not generally accompany cystocele. Scanzoni, Fritsch, Kolischer and others teach that this form of incontinence is due to a conically dilated posterior urethra whereby the length of the urethra is diminished and the sphincter is overstretched and weakened; that the condition is brought about by a dilated and relaxed vagina and perineum and a sagging downward of all of the pelvic orgars. My first two cases showed this dilatation of the urethra and in addition to an open, gaping vagina showed a retroversion of the uterus, a condition which frequently accompanies a beginning prolapsus uteri. Stoeckel's two cases show that the condition may be the result of actual loss of the sphincter muscle due to sloughing, and the case of Pousson would indicate that not only may the posterior urethra be dilated but that the whole canal may show this condition. Finally the cases of Glas and Zuckerkandl would teach that a defective local innervation or a senile genital atrophy may be productive of incontinence.

Treatment. The prophylaxis is in this malady as in many others very important. One needs only mention the proper conduct of labor such as allowing the complete dilatation of the cervix and the emptying of the bladder before the application of forceps; the proper application of the forceps to prevent slipping with lacerations by its blades; the timely use of forceps in the second stage of labor to prevent sloughing from prolonged pressure by the fœtal head against the neck of the bladder and urethra; the careful and immediate repair of extensive lacerations of the vagina and perineum and the preventing of infection, etc. The proper selection of cases for symphyseotomy so that there shall not be too wide a separation of the pubic bones with its consequent trauma to the soft parts is likewise important. Following labor the incontinence which at times immediately ensues needs generally give no alarm as it disappears with the subsidence of the œdema, ecchymoses, and pressure paralysis. After a few weeks the replacement of a retroposed uterus and the application of a well fitting pessary which seems not only to hold this organ in place and favor involution of the pelvic tissues but by the gentle pressure of the anterior part of the pessary against the urethra tends to cure the incontinence. Milne Murray (Edinburg Med. Jour., April, 1881) reports a case in which the ailment had lasted fourteen months following a prolonged and difficult labor which he cured by the application of a galvanic current. Others have recommended this form of treatment. Baldwin (Amer. Gyn. & Obs. Jour., N. Y., 1899, XIV, 131) relieved his three cases by means of pessaries, two by the Emmet and one by a ball pessary. Gersuny, Clerc-Dandoy (J. Med. de Brus., 1906, XI, 15), Stoeckel (Monatschr. f. Geb. u. Gyn. Berl., 1903, XVII, 1239–1241) and others report cases cured by the injection of paraffin around the urethra. Eckhardt (VI versamml. d. deutschen gynaek. Gesellsch. in Wien, 1895) exhibited an instrument which by pressure in the urethra partially relieved the incontinence. The woman could hold her urine 2½ hours at a time.

Pawlik (Zeitschr. f. Geb. u. Gynaek., 1882, bd. VIII, s. 38) describes an operation for incontinence in a very interesting article. He says that in certain cases of vesicovaginal fistula which involve the sphincter vesicæ muscle that after repairing the fistula the women still have incontinence. In one case, however, upon which he operated the urethra was entirely gone and to his surprise after its restoration by a plastic operation he found that the woman had continence. From this case he conceived the idea that the sphincter is not essential to continence. He likened the action of the urethra to an acutely anteflexed uterus where there is no sphincter and where the uterine contents are retained by the anterior and posterior uterine walls lying in close contact at the point of flexion and can be expelled only by contractions of the uterus. He endeavored to produce this condition in the urethra in cases of incontinence by bending the urethra sharply around the ligamentum arcuatum and also by pulling the urethra in tension from side to side in order to bring the anterior and posterior walls in close contact. His endeavor was to draw the anterior part of the

urethra towards the clitoris in order to produce the kinking, and the lateral tension (Querspannung) he endeavored to effect by excising a wedge-shaped piece of tissue on each side of the urethra and by suturing the sides of the urethra to the outer side of the excavation. He describes his operation as follows: The patient is placed in the knee-chest position and a Simon's speculum introduced into the vagina. Then with a tenaculum he saw how far to the left he could pull the urethra and marked this point. He then saw how far he could pull the meatus towards the clitoris and marked this point. He now excised a piece of tissue corresponding to these points and placed his sutures so as to pull the urethra forward and to the left side at the same time. After the wound had healed he did the same procedure in the opposite side. The operation was done in two stages to avoid cutting off the blood supply and thus avoided necrosis. He reported four cases with success and says the cases grew gradually better, being able to retain more and more urine as time passed.

Dudley (Jour. Amer. Med. Assoc., June 3, 1905) describes an operation devised by him which is essentially the same in principle as Pawlik's but which has the advantage of being done at one sitting. Dudley makes a horseshoe incision between the meatus and the clitoris and extending along the sides of the urethra its whole length. The urethra is drawn forward and stretched laterally by means of properly placed sutures.

Albarran operated by dissecting free the urethra and narrowing its lumen by two sutures, one placed anteriorly and one posteriorly, the application of the suture giving the cross section of the urethra a heart shaped appearance. He formed two flaps by making an incision from the meatus to the clitoris and dissecting back the tissue on either side. The meatus is advanced just under the clitoris and sutured there, and the flaps brought together under the urethra to support it.

In the Centr. f. Chir., 1889, No. 25, Gersuny describes an operation which he performed upon a girl who had congenital epispadias. She had been operated upon three times, once by Pawlik who did his advancement of the urethra, all without success. Gersuny conceived the idea of twisting the urethra so as to make the mucous membrane to lie in folds which ran spirally lengthwise the canal and in the middle of the urethra fully closes its lumen. From this point outward and inward the urethra dilates and he compares the condition to a rubber tobacco pouch in which the twist closes it. In the case just mentioned he operated three times before he got the desired result. The first time there was a rotation of 180° with primary union; the second time, a rotation of 90° with primary union; the third time, another rotation of 180°, making altogether a twist of 1¼ times. The final result was that the woman could hold her urine for hours, the bladder could retain one half a litre, and it required four minutes to empty it. The operation is performed as follows: One fixes the edge of the meatus by means of two sutures which act as guides. The meatus is encircled by an incision and the entire urethra dissected free, including as much of the surrounding tissue as possible. By means of this suture the urethra is rotated until a very small catheter can just be made to pass and the urethra is sutured in its new position. He and his followers claim that the operation is applicable to all cases where the sphincter vesicæ is wanting, is useless, or cannot be made to functionate. Stockmann, Weinleshner, (Glas), Fritsch, Hofmoki, Zuckerkandl, V. Braun and others have operated with success by Gersuny's method. One would expect necrosis of the urethra where this stricture was rotated as much as has been done in some cases, 360° at one operation, but in only one of the cases which I have been able to find was there a slight necrosis and this did not apparently interfere with the result.

Pousson (Bull. et Mem. de la soc. de Chir. de Paris, XVIII) on June 12, 1891, operated upon a woman who had borne two children and who had a much dilated urethra (it would admit the little finger) by a method which was a combination of Pawlik's and Gersuny's. He dissected the urethra free 1½ cm. towards the bladder and advanced it to the clitoris and at the same time rotated it 180°. He claimed priority over Pawlik although he reported his case later.

Schultze (Wiener Med. Blatter, 1888, XVIII

u. XIX) describes an operation for incontinence done by him first in 1878 in which he excises an oval piece from the neck of the bladder and urethra about 3 cm. long and 1 to 1½ cm. wide in the middle through the entire thickness of the septum. He sutured the edges of the resulting opening over a catheter. He was successful in curing two cases. One after the first, and the other after the third operation. Other operators have followed this method with varying success. The objection to the operation is the liability of the wound not healing in consequence of the necessity of placing a permanent catheter or of frequent catheterization. To overcome this objection it has been proposed to make a temporary vesicovaginal fistula until healing takes place, when the fistula can be closed by another operation.

Frank (Centr. f. Gyn., 1895, s. 55) modified the operation done by Schultze in that he did not resect the bladder or urethral mucosa but removed a piece only from the anterior vaginal wall. In suturing, however, he gathered up the muscle so as to make a roll and narrow the internal urethral orifice. In this way he avoided the possible formation of a fistula. Frank, Engstrom, Lapthorn Smith and others have reported cases by this method of operating; Lapthorn Smith (Canada Med. Rec., 1898, XXVI, 531) cured a case of incontinence developing after a severe labor when "*there seemed to be no life in the sphincter*" accompanied by a large rectocele and cystocele. He operated for cystocele and tightened the sphincter by the denudation further than usual towards the meatus and gathered up the sphincter as described by Frank. A posterior colporrhaphy was likewise done at the same time. The result was described as perfect.

Van der Warker (Amer. Med., 1904, VIII, 273) recommends narrowing of the vagina just over the sphincter vesicæ but remarks that it does not as a rule cure permanently. The same method has been used by Winckel and others.

Gilliam and Fest have described an operation to tighten the external urethral opening by excising a piece of tissue on either side of it and suturing so as to bring its anterior and posterior surfaces in close contact.

I have operated only once for this form of incontinence. This was upon case No. 1 where the incontinence came on four years after her last labor and had been in existence for nine months. I operated according to the Frank method combining with the plastic operation over the posterior urethra and neck of the bladder an anterior and posterior colporrhaphy with suspension of the retroverted uterus. The tightening of the posterior urethra was so marked that the woman had to be catheterized for about two weeks but after that the urination was quite normal and now, after three years, there has been no return of the incontinence.

In conclusion I would say that the incontinence which comes on immediately after labor due to swelling, etc., of the urethra and bladder neck, as a rule soon subsides without treatment. Later one should make a careful examination of all the pelvic organs, replace a retroposed uterus when necessary, hasten involution of the pelvic structure by douches, tampons, pessaries, etc. In persistent or increasing incontinence some operative procedure is usually necessary. The nature of the operation should depend upon the condition of the urethra and bladder neck. The Frank operation, combined with an anterior and posterior colporrhaphy in cases where there is a relaxed and gaping vagina, and some appropriate operation for retroversion where this exists, will cure the average case of incontinence coming on after labor, and of not too long standing. In cases where there is a marked dilatation of the urethra and of long standing or cases where from necrosis the muscular wall of the neck of the bladder and urethra are wanting, Gersuny's operation seems to offer the best hope of cure. Pawlik's and Dudley's operation have likewise given good results at the hands of their originators.

THE SUBINVOLUTED UTERUS[1]

A Sketch of the Life History of the Uterine Musculature; an Outline of the Pathology of Subinvolution; General Plan for its Treatment. A Brief Report of Twenty-three Cases Treated by Hysterectomy

By RICHARD R. SMITH, M. D., Grand Rapids, Michigan

IN the present paper the term "subinvolution" is meant to be extended to every parous uterus which has failed to undergo normal retrogressive changes, whether the conditions be found a short or a long time after pregnancy. It is my purpose to review briefly the pathology of this condition and to outline a general plan for its treatment, hoping to stimulate among you a little additional thought and interest in this rather important subject.

The subinvoluted uterus, with its commonly associated conditions, undoubtedly causes discomfort and sometimes serious invalidism in a large number of our American women. If dealt with intelligently, however, it is peculiarly responsive to treatment and would seem to have met with less consideration in our textbooks and literature than it deserves.

As a basis of study of all diseases of the uterus, and particularly those associated with disturbances of its function, it is well to know something of its development. It is for this reason that I wish to review with you briefly the life history of the uterine musculature, before pointing out to you the changes found in the subinvoluted uterus.

The uterine musculature has been the subject of much painstaking study by a considerable number of men. To be especially mentioned, is the work of Helie, Werth and Grusdew, Roesger, Sobotta (who has taken up the matter from the standpoint of comparative anatomy), and Bayer, whose studies extended over twenty years and who has presented his results in a most attractive monograph. I shall have the pleasure of showing you a number of his illustrations. All agree that the work is still far from complete. The results of their investigations, however, are worthy of study.

We may differentiate in the fœtal uterus two morphologically and genetically different layers of unstriped muscle fibers, the inner one derived from mesodermal (until then undifferentiated cells) surrounding the Müllerian duct, a simple extension of the same structure found in the tube; the outer one derived from the connective tissue of the mesometrium and serosa and spreading over the other as a cloak. In some of the lower animals, even at maturity, we find these two layers distinctly divided. (Figure 1.) In the course of its phylogenetical

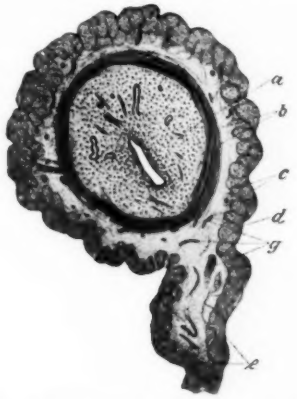

Fig. 1. Section through the uterine horn of a mouse. (Sobotta.) *a*, Mucous membrane; *b*, Circular layer of muscle; *c*, Longitudinal layer of muscle; *d*, Serosa; *e*, Ligamentum latum; *g*, Blood-vessels

development, the structure of the uterus shows a progressively intimate mingling of its fibers and in the human female — the highest type — we find in the adult any such arrangement of fibers difficult to trace. A study of the uterus in the fœtus, however, shows this primitive arrangement to be at the foundation of its structure. The first-named primordial muscular anlage — the so-called archimyometrium — is found distinctly present as early as the fifth month. (Fig. 2.) It consists

[1] Read before the Chicago Medical Society, May 12, 1900.

Fig. 2. In this section from the uterus of a fœtus of six months is shown the ring-like layer — the primitive one. The second layer has not yet assembled. (Bayer.)

mainly of circular fibers surrounding tubal lumen and uterine canal, this simple arrangement being broken by the union of the two canals as they come together to form the uterus. The second layer, or paramyometrium, of later origin, found sometimes as early as the seventh month, assembles outside of this and is composed of fibers continuous with those of the round, ovarian, and sacro-uterine ligaments and the vagina. To these are added commisure fibers, binding all intimately together and producing an extremely complicated structure. From the seventh to the ninth month there takes place a rapid advance, so that the uterus at birth has made considerable progress in development, differing quantitatively rather than structurally, from the adult organ. (Fig. 3.) At this time it measures one-twelfth of the body length as compared with one twenty-fourth of the body length found in the adult. The state of development at birth, however, varies considerably, and this variation is found chiefly in the paramyometrium, the archimyometrium remaining much more constant. Immediately

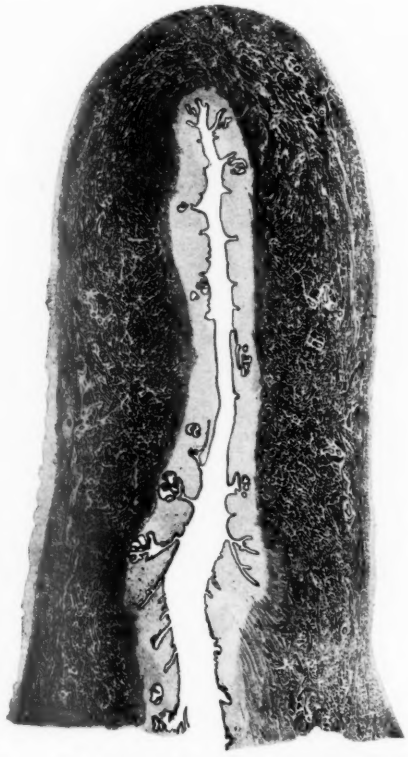

Fig. 3. The comparatively well developed musculature of a new-born infant, to be compared with that of an infant at two months, seen in Figure 5. (Bayer.)

after birth there takes place a remarkable atrophy of this structure and at the end of the first month we find the uterus smaller and the individual fibers atrophied. (Figs. 4, 5.) During childhood we miss any marked increase

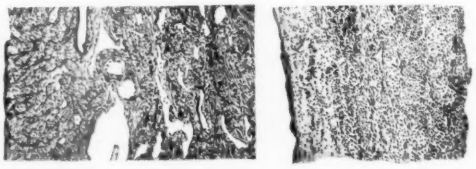

Fig. 4. On the left is a section from the uterus of a new-born infant; on the right one from an infant of one year. Note the difference in the texture of the two sections — the one coarser on account of the large size of its cells. In stained sections it is more difficult to distinguish muscle from connective tissue, the cells taking their individual stains less readily. (Bayer.)

Fig. 5. Section through the uterus of a two months' old child. Compare with Figure 3 and note the so-called post-fœtal involution. (Bayer.)

in size, but there takes place a regeneration and shortly before puberty we find the condition at birth reinstated.

Bayer differentiates two distinct types found during childhood: a well developed type, with comparatively thick body, a short cervix (Fig. 6); and secondly, an atrophic type, with short, thin body and long cervix. (Figs. 7, 8.) Many uteri are of a more or less intermediate type. The first form is associated with well developed round ligaments, the latter with much smaller ones. It is probable that the ovaries also show a corresponding condition of development. I call attention to this as showing the marked difference in uteri during childhood and the possible disturbance of function after puberty, coming from this source. (Fig. 9.)

At puberty there takes place a remarkable development of all the layers of the uterus, but more particularly the outer. The serous and subserous connective tissue is invaded with muscle fibers, the vessels come to lie deeper in the wall and increase in size. At this period in life there is also a considerable difference in such changes. (Fig. 10.)

Fig. 6. Section from the uterus of a two year old infant — the well developed type. Note the comparatively thick body and short cervix. Compare with Figures 7 and 8. (Bayer.)

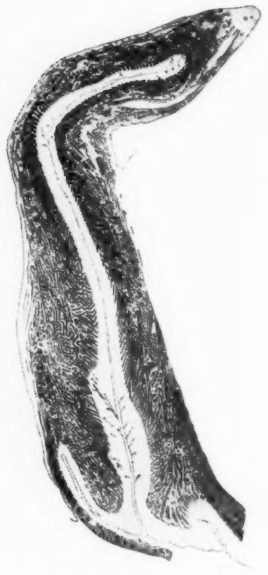

Fig. 7. Section from uterus of four year old child (atrophic type). Note great length of cervix, small body tapering to a ridge. (Bayer.)

Menstruation, subjected to great irregularities on account of perverted influences from without, requires also, for its normal course, a uterus which is more or less near the normal in structure. During menstruation there takes place, by a diapedesis, an extravasation of blood from the capillaries in the subepithelial network. This blood finds its way between the epithelial cells into the cavity of the uterus. This process is largely a passive one — the blood supplied to the capillaries is now commonly thought to be regulated by uterine contractions, which are supposed to regulate its flow by pressure upon its blood-vessels. Under ordinary circumstances this is nicely adjusted, and like most other physiological processes, may take place normally, even when the mechanical conditions are somewhat disturbed. It is easy to imagine, however, that if this control is interfered with through some mechanical imperfection, that irregularities must take place. The irregularities of menstruation, before childbearing, are now commonly supposed to be due, after allowing for the nervous system, to a disproportion of the muscular and fibrous elements of the uterine walls. Our knowledge of the mechanics of menstruation is still, however, very imperfect. (Fig. 11.)

By all odds, the most marked changes which take place in the uterus during its life history are those brought about by pregnancy. In early pregnancy they are due largely to those influences affecting many other structures of the body at this time, as may be seen by comparing the uterus of a tubal pregnancy with that of the normal. Later the changes are effected chiefly by the growing ovum. From an organ of about 6½ cm. in length, it develops to one of 36 cm. with a somewhat corresponding increase in other dimensions. Krause estimates that its capacity increases 519 times. In weight there is an increase of from 30 to 1,000 grams. There takes place an hypertrophy of

Fig. 8. Section of uterus from seven year old child (atrophic type). Note long cervix, small body. (Bayer.)

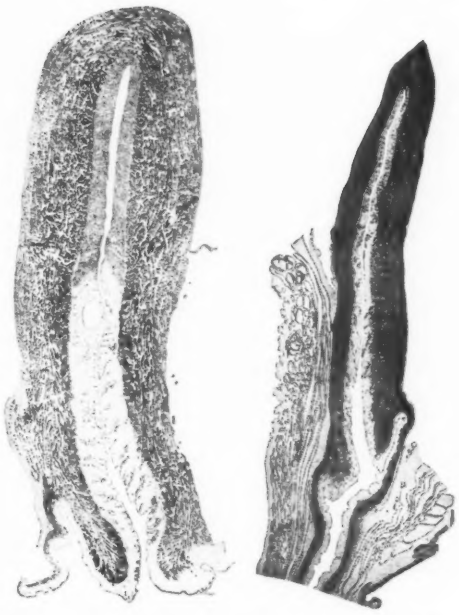

Fig. 9. Sections of uteri taken from fourteen and fifteen year old subjects, but not as yet menstruating. Note here also the difference in structure, length of cervix, and shape of body. (Bayer.)

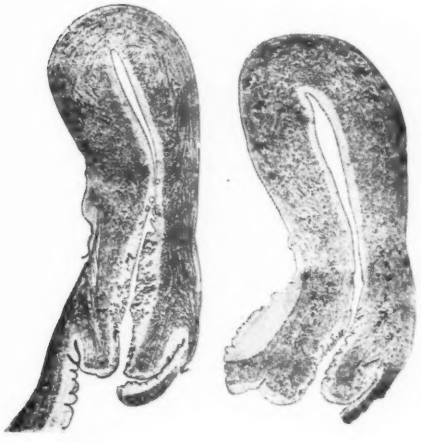

Fig. 10. The left picture shows the infantile type prevailing after puberty; the right the better developed type. Note the slight difference in the length of the cervix, the different blood supply, and generally more robust form of the latter. (Bayer.)

Fig. 11. This is the normal, well developed uterus from a fifteen year old subject in whom menstruation has begun. (Bayer.)

the muscle cells already present and during the first few months, at least, new ones form. The individual cells, according to Williams, are from two to seven times wider and from seven to eleven times longer than in the non-pregnant state. The blood-vessels are also much increased in size and number. Under the influence of pregnancy the arrangement of muscle fibers to be found in fœtal life may be here again more or less distinctly traced. The proportion of muscular over fibrous tissue is also somewhat increased at this time.

The changes brought about by involution, as far as size goes, are principally due to those

Fig. 12. Normal parous uterus from twenty-seven year old subject. (Bayer.)

found in the muscular layer. The number of cells does not materially decrease, but they lose their protoplasm and, according to Sänger are found in full involution to be one-eighth of the size found in pregnancy. Other changes take place also. The amount of connective tissue is relatively increased and the vessels undergo certain changes to be enumerated later. (Fig. 12.)

Theilhaber and Meir have studied the musculature of the uterus in regard to its connective tissue, and state that there is a slight relative increase following childbirth, and which is augmented, also, at succeeding births. Although differing somewhat in subjects, they found in childhood a proportion of about one part muscular and two parts fibrous tissue; during the period of sexual activity two-thirds muscle tissue and one-third fibrous tissue. After the climacteric the proportion is again reversed. The estimate is best made by comparing the gross appearance of specimens stained with Van Gieson's stain, either with the naked eye, or a reading-glass.

The elastic tissue of the uterus forms an important part of its structure. This has been made the subject of a special study by Pick of Germany, and by Anspach of Philadelphia, who has given us a most excellent article on the subject. According to Pick the elastic fibers have two main sources: from the elastic tissue in the serous coat and from the same in the coats of the blood-vessels. Pick draws attention to the arrangement of the elastic fibers as being highly significant. Its preponderance in the subserous and supravascular layers, their direction toward the endometrical cavity, and their close conjunction with the muscle fibers, show a definite purpose. They serve, not only as a support to blood and lymph vessels, but reinforce the muscular action of the uterus, protect it from being overstretched and make easier the return to a passive state after distention or contraction. The elastic fibers increase up to the fourth month of pregnancy, after this there is no apparent increase except in the paracervical tissue, where it plays an important part in labor. During the puerperium, when the other tissues of the uterus undergo involution, there is an actual increase in the amount of elastic tissue. There is also a marked tendency toward clumping of its fibers, which we will discuss later. After the menopause there is a diminution in the caliber of the vessels from a thickening of their walls and again a marked increase in the elastic tissue about these groups. In the external layers of the uterus — the serous and subserous — there is also a marked increase in the elastic tissue. Melnikow-Raswendenkow (quoted from Anspach) compares it to similar changes taking place in other organs, the kidney, liver, heart, spleen. It is believed to take the place of atrophied parenchyma, be it epithelial or muscular, and furthers the

mechanical internal equilibrium of the organ. It is the vis-a-tergo that prevents a disturbance of the dynamics of secretion. When the uterine fibers atrophy, it helps contract the vessels and takes the place of the lost parenchyma.

Dr. Anspach has kindly given me a number of drawings which illustrate very well the changes in the vessels during pregnancy. (Figs. 13, 14, 15, 16, 17, 18, 19, 20, 21, and 22. Note explanatory text under each drawing.)

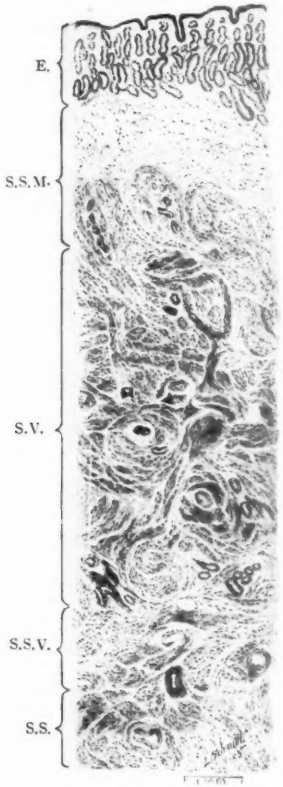

Fig. 13.

Fig. 13. Transverse section through entire wall of multiparous uterus at the fundus. Hematoxylin Eosin. Stratum subserosum (S. S.). Stratum supravasculare (S. S. V.). Stratum vasculare (S. V.). Stratum submucosum (S. S. M.). Endometrium (E.). (Anspach.)

Fig. 15.

Fig. 15. Multiparous uterus. Area of the vascular layer, showing some of the smaller vessels. Weigert's. A., arteries. V., veins. L., lymph spaces. The increase in elastic tissue, the result of pregnancy, is at once seen when this picture is compared with Figure 14. Observe the tendency to clumping of the fibrils. (Anspach.)

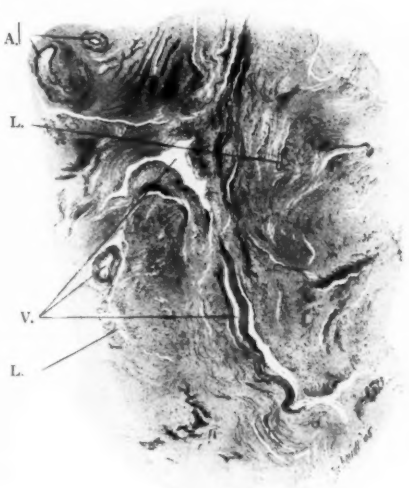

Fig. 14. Nulliparous uterus. Area of the vascular layer showing some of the smaller vessels. Weigert's A., arteries. V., veins. L., lymph spaces. There is little elastica in this layer except that of the vessel walls. In the arterioles a definite internal elastic membrane can be seen; the veins show an irregular arrangement of the elastica — most of it at the periphery of the vessel. The elastica of the lymph spaces is not well formed and consists of isolated fibrils. Note the fineness of the elastic fibers and the absence of clumping. The clefts in the tissue with no elastica about them are artefacts produced by shrinkage of the tissues during the hardening. (Anspach.)

By following the history of the uterine musculature thus we note that it is subject to great differences in structure at different periods of

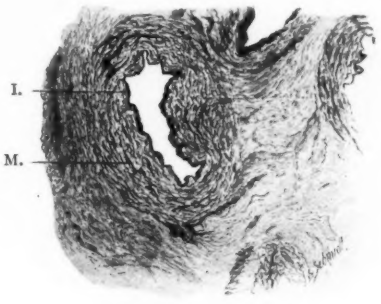

Fig. 16. A group of arteries from the vascular layer of a nulliparous uterus. Weigert's. Note the fine anastomosing smooth fibrils throughout the media (M.). The internal elastic membrane (I.) is well formed and regular. There is no breaking or clumping of the fibrils. (Anspach.)

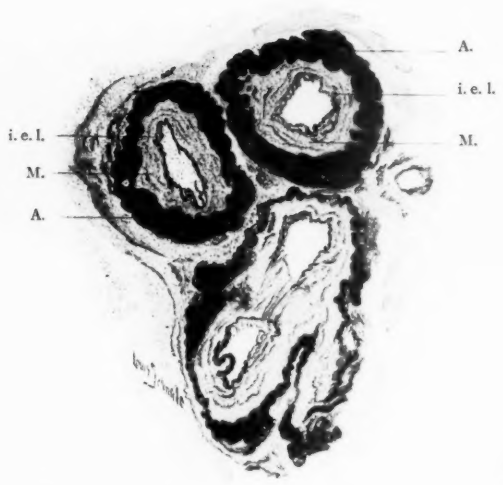

Fig. 17. Group of arteries from vascular layer of multiparous uterus. Weigert's. The internal elastic lamina (i. e. l.) appears well preserved; there is no tendency to clumping of the elastic fibers in the media (M.). The adventitia (A.) presents solid clumps of elastic tissue. *Periarterial degeneration.* Compare with Figures 16 and 18. (Anspach.)

life; up to the childbearing period such difference are largely those of development, after childbearing up to the menopause we note certain degenerative changes which may be

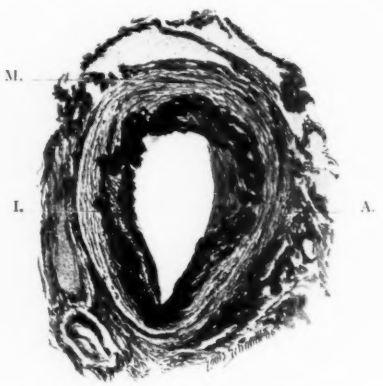

Fig. 18. Medium-sized artery from vascular layer of multiparous uterus. Weigert's. Note the increase of elastic tissue in the media (M.) and adventitia (A.). The internal elastic lamina (I.) is greatly thickened and the fibers are broken and gathered into clumps. *Intramural arterial degeneration.* Compare with Figure 16. (Anspach.)

Fig. 19. Same artery as in Figure 18. Van Gieson's. Observe the increase of fibrous tissue (red) in the media (M.) and its irregularity. *Intramural arterial degeneration.* (Anspach.)

roughly summed up in an appreciable degeneration of muscular elements, a slight increase of fibrous elements, degenerative changes in the vessels, and a marked increase in the elastica. The changes in the vessels are purely physiological, due to the lessened demands upon them following pregnancy. The elastica

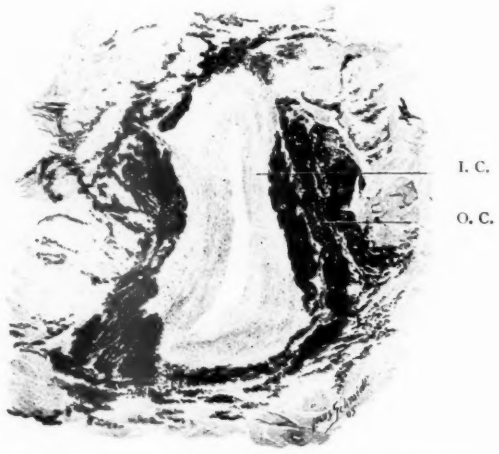

Fig. 20 Large vein from vascular layer multiparous uterus. Weigert's. The inner coat (I. C.) shows no change. The outer coat (O. C.) is represented by large deposits of elastic tissue in clumps. *Perivenous degeneration.* (Anspach.)

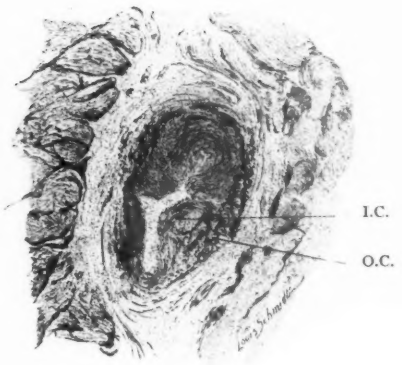

Fig. 21. Medium-sized vein from vascular layer of nulliparous uterus. Weigert's. Observe that the inner coat (I. C.) is spun through with fine elastic fibrils; the elastic tissue is especially condensed at the border between the inner coat (I. C.) and the outer coat (O. C.). It is all rather irregular but shows no tendency to clumping. (Anspach.)

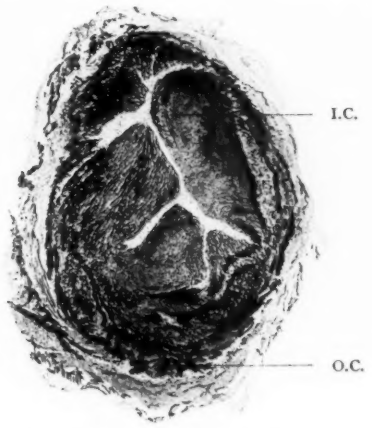

Fig. 22. Large vein from vascular layer in multiparous uterus. Weigert's. The inner coat (I. C.) is thickened and fine elastic tissue is seen throughout; between the inner coat (I. C.) and the outer coat (O.C.) the elastic tissue is considerably increased and shows considerable clumping. (Anspach.)

simply helps to maintain the organ in a state of mechanical equilibrium. In the subinvoluted uterus, however, we note that such changes are irregular.

Theilhaber and Meir, as well as others, have noticed the marked increase of fibrous elements in the subinvoluted uterus. This may best be seen by comparing gross sections stained with Van Gieson's or similar stains. It may also be noted and can be fairly well estimated by bisecting uteri removed by hysterectomy, and examining the cut surface.

The cause of the bleeding so commonly found with such uteri has been the chief subject of interest with most investigators. Theilhaber and Meir think it due to a muscular insufficiency due to the increase of fibrous elements at the expense of the muscular, of which I have spoken. Pick and Anspach are inclined to the view that a lack of proper increase of elastic tissue causes it, and Anspach cites three cases with uncontrollable bleeding in which such a condition was present. Reinche, Dunning, Findley, and others ascribe the bleeding to vascular changes.

Following somewhat the method of Anspach we have examined eight of our subinvoluted uteri removed by hysterectomy, staining them with Weigert's and Van Gieson's. For comparison, a considerable number of other uteri were stained in similar manner. This was done merely for the purpose of reviewing as far as possible, the results of others, more especially of Anspach and Theilhaber and Meir. By comparing the sections of subinvoluted uteri stained with Van Gieson's with those of the non-pregnant uterus, the increased amount of fibrous tissue was marked in all of our specimens. We could also note the clumping of the elastic tissue about the vessels in the multiparous uterus. Many of the cases associated with hemorrhage showed, apparently, a lesser amount of elastic tissue, but this did not hold good in all cases, so that we were unable to verify Anspach's suggestion that in this might lie the cause of hæmorrhage.

Associated with a subinvoluted uterus are certain other findings which are almost constant and which bear an intimate relation to the uterus itself. First of these to be noted is a thinning and lengthening of the uterine ligaments and supporting structures. Such a uterus, when not adherent, can be pushed in widely different directions. It is a factor in the common prolapse of such an organ or its tendency to sag downward. The tissues of the vagina are also usually relaxed. Secondly, there is a greater blood supply than we see

under normal circumstances, as may be seen by an examination of the broad ligaments and in operations upon the walls of the vagina. Thirdly, it is often associated with lacerations of the cervix and outlet.

Just why one uterus should involute normally and another not, is by no means clear. One has but to scan any of our modern textbooks on the subject, and note the long list of causes given, to be convinced that we know very little about it. We are apt to assume in this much more than we know. Some factors, however, we may suspect as having some bearing on the subject. Causes which lead to an increased blood supply to the pelvic organs may thus in some way interfere with proper involution. It might reasonably be presumed that lacerations of the cervix, for instance, in nature's attempt to heal the same, would bring more blood to the part and thus in some way prevent perfect involution. Retroversion and prolapse, through their commonly associated increased blood supply, may act in the same way.

Treatment. Involution should be practically complete at the end of six weeks from labor. A systematic examination of every woman at this time would undoubtedly lead to the correction of such pathological processes as are commonly associated with and may be the cause of subinvolution. If lacerations or displacements are found at this time, with a large uterus, their correction is more than ever indicated. It must always be borne in mind that the earlier the condition is attended to, the better is the chance of controlling it by minor procedures. Curettment is applicable to patients in whom the last labor has been comparatively recent — say two or three years. Gordon, as early as 1884, suggested taking a large V-shaped wedge from the uterus as in trachelorrhaphy. This is undoubtedly of much benefit where the trouble has not been of too long duration. An amputation of the cervix may be carried out when there is marked hypertrophy of this part and when future childbearing is not probable. All of these procedures are well known, are often carried out, and when rightly applied are effectual.

There remains, however, a class that I do not believe can be satisfactorily reached by any of these measures. I refer to the woman who is nearing the menopause, who has borne children for a number of years, and in whom symptoms have existed for a considerable length of time. Conservative measures, such as I have named, are peculiarly apt to fail, or to benefit but slightly. Hysterectomy — by which I mean either a supracervical amputation, or in case the cervix is much eroded and thickened, a complete hysterectomy — gives far better results. The preservation of the childbearing function, which in the younger woman is such a strong indication for the saving of these organs, ceases almost entirely at this time of life to be of any importance. Such patients are peculiarly easy to operate upon, since the uterus, through the relaxation of the ligaments, becomes easily accessible to operative measures and I believe that this operation does not offer any more danger than many of the so-called simpler operations when opening the abdomen is necessary.

I wish to briefly report twenty-three hysterectomies done for this indication. This did not include, of course, those in which other lesions were the primary factors, such as pelvic infections, neoplasms, or marked prolapse. It might be well to state, however, that my opinion has been largely influenced in this by the many satisfactory cures that one obtains where hysterectomy is demanded for such other lesions. Of the twenty-three patients mentioned, the youngest was thirty-five, the oldest fifty-five, and the average age forty-two. Nine of the twenty-three were losing so much blood at or between menstrual periods as to be serious. Five had profuse flowing, enough to warrant active interference; in nine the flow was practically normal, if present at all. They were suffering simply from the marked pelvic discomfort to which such patients are subject. In twelve of the patients the position of the uterus was practically normal, in six there was retroversion, in four there was some tendency to prolapse, in one there was a considerable amount of prolapse with retroversion, but the uterus was very large and this formed the chief indication for its removal. There was no mortality in this list nor unusual convalescence from operation. They have all been practically free from every symptom

referable to the pelvis and have been among the most appreciative patients with whom I have had to deal.

Against this operation may be argued its relative seriousness, the bringing on of an artificial menopause, and certain ideas of sentiment which the patient may have against the removal of her sexual organs.

On the other side may be placed complete cessation of pelvic symptoms, and to most of these patients this means far more than any of the above things I have stated.

It might be argued that these patients are near the menopause, and that when this takes place their symptoms will cease. It is just here that the climacteric is apt to be delayed and even then the symptoms do not always subside. I believe it much better to undergo such an operation than to wait perhaps five or even ten years, with the accompanying undermining of the woman's health and nervous system. I am convinced that we have been too conservative with such patients, and would urge hysterectomy being done more frequently than is now commonly practiced. On the other hand, no hysterectomy should be done without careful weighing of every point pro and con. The things that have the most weight in my mind are: the long continuance of the symptoms, severe loss of blood, the non-relief by simple procedures, the age of the patient, the size and condition of the uterus.

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MULTILOCULAR CYSTS OF THE JAWS[1]

By DEAN D. LEWIS, M. D., Chicago, Illinois

THE jaws are occasionally the seat of cystic growths, which cannot be classified as either periosteal or follicular cysts. Although these growths differ in histology, clinical course, and mode of growth they have many things in common, such as a central position in the jaw (they may, however, occur upon the free margin of the gums), and the tendency to benignancy, even though composed of misplaced epithelium. These tumors, which appear in the literature under a number of different terms such as "multilocular cystic tumors of the jaws," "kystes multiloculaires," "cystoma proliferum multiloculare" and "epithelioma seu adenoma adamantinum," are generally regarded as uncommon. Senn states that multilocular cysts of the jaws are rare; Steensland in 1901 could find in the literature but 21 cases which he was willing to accept as undoubted examples of tumors of this character.

Undoubtedly these tumors are more common than is generally supposed. There has been until recently, considerable discussion as to the origin and classification of these growths, which, however, present fairly typical histologic characteristics. Probably some of them have been classed with other tumors of the jaw, for even such an authority as Bland-Sutton states that a careful re-examination of a few of the specimens described as multilocular cystic epithelial tumors of the jaw and a study of the description of others, especially those arising in individuals past middle life, has satisfied him that many of them are endotheliomata.

Recently I have had the opportunity of examining three of these tumors which presented some interesting clinical features. One was removed by Dr. A. D. Bevan, one by Dr. S. C. Plummer and one by myself. The case histories and the anatomic peculiarities of these three tumors will be given before the clinical features of this group of tumors are discussed.

Case 1. Mr. G. S., aged 66, a janitor by occupation, was referred to me July 12, 1909, by Dr. E. C. Rosenow. He stated that five years ago he noted for the first time an enlargement of the right half of the mandible in the region of the molar teeth. The swelling, which gave rise to considerable pain, gradually increased in size. It was frequently incised or punctured to permit of the escape of material which the patient describes as pus. A year after the swelling appeared the patient consulted a surgeon who removed a piece of tissue for microscopic examination. The scar following the operation is still visible over the most prominent part of the growth. After examination of the tissue the surgeon deemed an operation inadvisable and suggested X-ray treatment. A large scar resulting from an X-ray burn can be seen over the center of the tumor. The tumor decreased somewhat in size after several exposures. The growth then gradually increased in size for three years, becoming as large as a good-sized fœtal head. For some time it has remained about the same size.

The patient now complains of a severe, almost constant pain in the part of the mandible affected. The right half of the body of the mandible and a part of the corresponding ramus is occupied by a tumor which is larger than a large fœtal head. It extends down to the hyoid bone in front, into the parotid compartment behind, to the middle of the ramus of the jaw above, and well into the mouth cavity internally. The mass projecting into the mouth extends backward to the anterior pillar of the fauces and displaces the tongue so much to the left that speech and mastication are interfered with.

Externally the tumor is covered by thin atrophic skin, which, however, moves freely over it. The skin is not even attached at the site of the scar which followed the incision for removal of tissue. The tumor is so large that it cannot be displaced upon the underlying tissues. The mucous membrane covering the growth is thickened and white. It moves freely over the tumor and is neither infiltrated nor ulcerated. About the center of the alveolar border is a sinus lined by granulation tissue through which a probe can be passed through the center of the growth down to the skin at the level of the hyoid bone. Every day the patient drains off about three ounces of fluid from one of the large cysts by passing a grooved director by the aid of a mirror into it. After the removal of this fluid he is generally relieved of his pain for the rest of the day. No sequestrum can be felt with a probe.

The growth is partially cystic, tense, fluctuating areas being separated by those of firmer consistency. Aspiration of the cysts reveals a sero-hæmorrhagic fluid, which contains streptococci. No parchment-

[1] Read before the Chicago Surgical Society, November 5, 1909. See Discussion, page 103.

Fig. 1. X-ray picture of cyst described in Case 1. The multilocular nature of the growth is shown, the different cavities being separated by heavy trabeculae, some of which contain bone. The extension of the growth into the mouth is also shown. The dotted line represents the outline of the soft tissues of the face and neck.

like crackling can be elicited. There is no enlargement of any of the regional lymph nodes.

The X-ray picture (Fig. 1) reveals several large cystic cavities and indicates clearly the cystic nature of the tumor. A diagnosis of multilocular cyst was made upon the clinical history and the physical characteristics of the growth.

The tumor was removed July 17, 1909. I was assisted by Dr. C. J. Rowan. The incision extended through the middle of the lip downward and backward to the hyoid bone and then upward and backward to the mastoid process. The tumor was so large that the jaw could not be held forward and respiration was considerably embarrassed. The cysts were therefore immediately aspirated, eight ounces of fluid being removed. The growth then partially collapsed and it could be manipulated easily. Respiration then became free. A typical resection of the jaw was then performed, after ligation of the external carotid artery which controlled bleeding very successfully. The jaw was divided at the middle of the ramus. Two small cysts remained and their lining membrane was curetted away.

The patient withstood the operation well. He developed pneumonia on the third day, but recovered slowly; convalescence being rather prolonged.

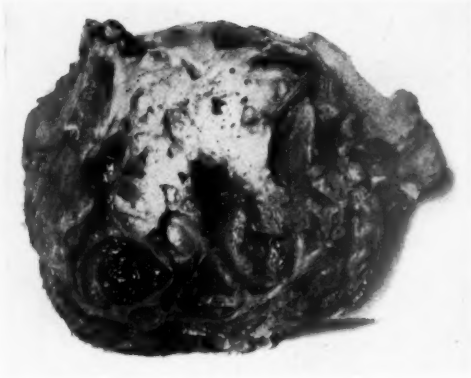

Fig. 2. Hemisection of tumor represented in Figure 1. The growth could not be manipulated because of its size before the cysts were aspirated. Several large cysts — some of which contain old blood clots — may be seen in the lower part of the figure. The white part of the tumor adjacent to the alveolar process is composed almost entirely of solid columns of enamel epithelium. One-half size.

GROSS APPEARANCE OF TUMOR

The tumor even after the removal of 8 ounces of fluid is as large as a big orange. It is made up of a large number of cysts varying in size from a lentil to a walnut. These are lined by a granular membrane which in some cysts is reddish in color, in others grayish. Some of the cysts contain old blood clots, but there is no history of any rapid increase in the size of the tumor such as might follow a hæmorrhage into one of these cysts. Interspersed throughout the tumor are solid, white masses of tissue such as may be seen in Fig. 2 near the alveolar border. These are composed almost entirely of epithelial cords. Transitional stages from solid tumor masses to small cysts and from small cysts to larger ones are abundant in different sections of the growth. There is very little bone in the tumor. Most of the septa are entirely fibrous, here and there a plate of bone being found.

Microscopic examination. The lining of the large cysts is composed of a rather firm, connective tissue stroma supporting an epithelial membrane, which resembles somewhat the mucous membrane of the gums in its early stages of development. This resembles closely adamantine epithelium. Scattered throughout the stroma are groups of cylindrical cells irregularly arranged, and cylindrical cells surrounding a lumen, reproducing histologically a gland tubule.

A section from the white masses adjacent to the alveolar border reveals a bizarre histologic picture. The stroma, which is not very abundant, supports a large number of narrow and broad cell columns, some of which are solid, some of which contain a lumen. These cell columns may be simple or branched, branching columns often ending with bulbous projections. The epithelial columns are supported by fibrous tissue which sends out process to join the adjacent cell columns. These columns are naturally cut in all possible directions. All the columns have an external layer of cylindrical cells. The nucleus is placed near the central end of the cell, the basal part forming a protoplasmic seam, the cells resembling closely those of the enamel organ in a six or seven months' old fœtus. The inner part of the cell column is made up of a number of cells, which have a net-like arrangement. The cells adjacent to the cylindrical epithelium are polygonal in shape, while those occupying the center, but also scattered among the polygonal cells, are stellate in form. The cytoplasm of the stellate cells stains with eosin and small colloid droplets are seen within it. Degenerative changes are evidently taking place within these cells, cyst formation being the result. Transitional stages can be traced from groups of cylindrical epithelium to branched columns, composed of cylindrical, polygonal and stellate cells, to small cysts and from small to larger ones. The diagnosis of multilocular cyst could be easily made upon the gross appearance of this tumor. The histologic picture is typical, the epithelial groups and columns reproducing the enamel organ in different stages of its development.

CASE 2. Mrs. M. A., aged 56, was admitted to Dr. Bevan's service at the Presbyterian Hospital July 21, '05. She stated that the present trouble began 14 years ago. She then complained of toothache, which would recur periodically, especially when she became chilled. The toothache gradually increased in severity and as some of the teeth on the affected side were carious they were extracted. At this time no swelling was noticed. Gradually the face became swollen, but no expansion of the alveolar process of the right maxillæ could be made out by intraoral palpation.

Fig. 3. Patient 18 days after removal of tumor shown in Figure 1. No prosthesis. There is considerable deviation of the left half of the mandible to the right.

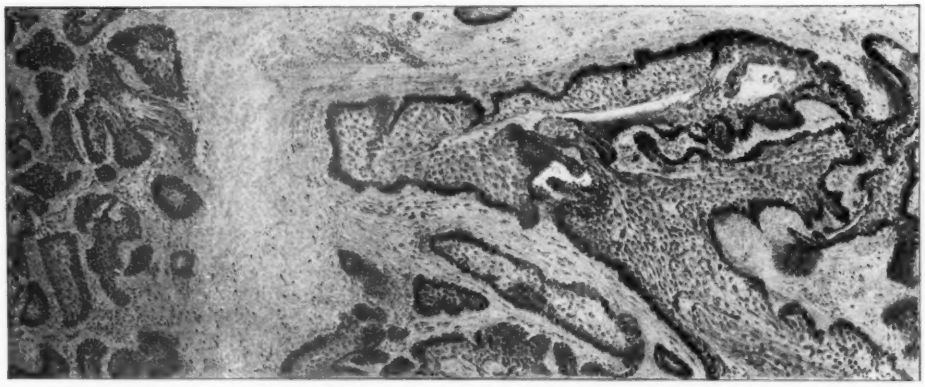

Fig. 4. Section of cyst removed by Dr. Bevan. Small, round cell columns, cut transversely, are seen in the left of the figure. The large branching cell columns in the right of the figure are composed externally of cylindrical cells, while the cells forming the inner part of the columns are polygonal and stellate in form. These cells have their prototypes in the cells of the tunica interna, stratum intermedium, and zona media of the germinal enamel epithelium.

In 1898, seven years after the first symptoms, an intraoral operation was performed by a dental surgeon and a mass, together with the surrounding bone, was removed from the posterior part of the right upper maxilla. After two years the tumor, accompanied by severe pain, recurred. Another, but more extensive operation was then performed and a diagnosis of dentigerous cyst was made.

The patient remained well for $3\frac{1}{2}$ years when the tumor again recurred. Physical examination at this time reveals a mass the size of a hen's egg which extends downward from the gum of the right maxilla posteriorly. This mass has the consistency of cartilage and is covered by a thick, white, mucous membrane which is not ulcerated. It is apparently encapsulated and when palpated a "parchment-like" crackling can be elicited. The teeth are wanting on the affected side. There are no enlarged lymph nodes. An examination of the antrum of Highmore was not made.

July 24, '05, an intraoral enucleation of the tumor was performed, the enucleation being carried wide of the capsule.

The antrum of Highmore was opened during the operation, as the mass extended well up into the cavity. The antrum was packed with iodoform gauze. The patient recovered rapidly from the operation and there has been no evidence of any return of the growth four years after the operation.

Macroscopic examination. The tumor, as large as a hen's egg, is composed of a number of small cysts which contain a mucoid material. The cysts vary in size from that of a pea to that of a hickory nut. They are separated by fibrous septa, but little bone or cartilage being found in the growth.

Microscopic examination. The stroma of this cyst is composed of dense fibrous tissue containing relatively numerous blood-vessels. No bone or cartilage is found in the sections examined. Solid columns of cells, which may be round, elliptical, or irregular, are found throughout this stroma. In the lower part of Fig. 4 may be seen several round columns which are cut transversely, while in the upper part of the figure, irregular columns with many outgrowths with bulbous endings may be seen. In the round and oval columns two types of cells may be seen. The cells upon the outer part are cylindrical, possessing a large nucleus which stains heavily with hæmatoxylin. The cells occupying the center of these columns are polygonal in shape, have a small nucleus, and considerable cytoplasm. A third type of cell, stellate in form, is found in the irregular columns shown in the upper part of Fig. 4. These stellate cells in some areas contain colloid droplets and are apparently undergoing degenerative processes to form the mucoid content of these growths. The cylindrical cells are very suggestive of enamel epithelium. The three different types of cells occurring within this tumor have their prototypes in the epithelium of the embryonal enamel organ, the cylindrical epithelium forming the tunica interna, the polygonal cells, the stratum intermedium, and the stellate cells, the zona media of this structure. The transitional stages from solid cell columns to small cysts and from small to larger cysts may be easily followed in different sections of this growth. The histology is typical of tumors of this character in advanced stages of development.

CASE 3. I am indebted to Dr. S. C. Plummer for the opportunity of publishing this case, the following history of which he has kindly prepared for me. This history was taken at Wesley Hospital, Chicago, October 1, 1908.

Miss F. T., aged 14 years, was born in Chicago of Swedish parents. She is a school-girl and weighs 85 pounds. Father died of pulmonary tuberculosis 5 years ago. Mother died of same disease seven years ago. Family history otherwise negative.

Fig. 5. Section of cyst removed by Dr. S. C. Plummer. The character and arrangement of the epithelium differs somewhat from that represented in Figure 4. It is apparently of an earlier embryonal period. This probably accounts for the rapid growth and recurrence of this tumor.

When 9 or 10 years of age, she went to a dentist to have two of her temporary teeth pulled, because they were being pushed out by the permanent ones. She has had no illnesses except measles.

In March, 1908 (seven months ago), she first noted a small white spot on the mucous membrane of the upper jaw over the site of the left canine tooth. There was no pain or other subjective symptom. This spot has gradually increased in size until at the present time it is as large as a hickory nut. The growth resembles in appearance granulation tissue. Occasionally the gums bleed moderately. The patient's general health is good.

On September 20, 1908, a portion of the growth bordering on the normal surrounding tissue was removed for microscopical examination. The laboratory report stated that the portion removed consisted of granulation tissue. On October 2, 1908, at Wesley Hospital the growth, together with two teeth and a portion of the alveolar process, was removed The wound healed promptly and the patient left the Hospital October 11th.

The laboratory report upon the tissue removed at this time was that of a spindle-cell sarcoma.

The patient reported to Dr. Plummer at intervals of about one month, and until six months after the operation the result appeared to be perfect. At this time a small cyst appeared at the site of the operation. This contained a clear fluid, resembling honey, and had all the clinical characteristics of a mucous cyst. It did not resemble in the least the primary growth. The cyst was opened and cauterized with silver nitrate. Other cysts of a similar nature appeared from time to time, and these were treated in the same way. After a few weeks a growth 1 cm. in diameter had formed, which resembled in every way the growth removed three months before.

A more extensive operation was then recommended but the patient's friends sent her to a practitioner who had a reputation for curing cancer by medicine. She was not seen again until early in September, 1909, at which time a large tumor was found, which caused the left malar region to bulge prominently and forced the upper lip so far forward that the mouth could not be completely closed.The tumor extended so far to the right that it involved the two incisor teeth upon that side. The surface of the tumor had the same appearance as when seen almost a year before.

On September 10, 1909, at St. Luke's Hospital, an excision of the left upper maxilla was performed. The patient was given ether. First, the left external carotid artery was ligated near its origin, and the incision closed and covered with collodion.

A laryngotomy was then performed and the ether was administered through this opening with a Trendelenburg apparatus. The pharynx was packed with gauze and a typical excision of the maxilla was performed. Portions of the right palatal process and septum were also excised.

The tumor completely filled the antrum of Highmore, its upper surface being unattached and rounded. The anterior wall of the antrum and the alveolar and palatal processes as well were involved in the growth and had undergone partial pressure atrophy. The free portion of the tumor had the appearance of a myxoma. The patient's recovery from the operation was uneventful.

Microscopical examination. This tumor differs somewhat histologically from the preceding. The stroma has much the same appearance but the arrangement of the epithelium differs somewhat. The same cylindrical epithelium is found, but it is somewhat more irregularly disposed. In some areas groups of this epithelium are found. Immediately adjacent to these groups, the epithelium may have a circular arrangement, enclosing a granular debris. This apparently indicates the beginning of cyst formation. Some of the tubules are regular in outline, while others are very irregular. They all represent the beginning of cyst formation. The small ones appear quite like those described in the clinical history as appearing

upon the mucous membrane of the gum and resembling mucous cysts.

The diagnosis of cystic adamantinoma could be easily made upon the characteristics of the epithelium, but the arrangement of the latter is not nearly as typical as that of the two growths described above. The polygonal and stellate cells are few in number. It is difficult to determine positively which of the three tumors is the most advanced, but I am inclined to believe that the last represents the enamel epithelium in the earliest stages of its development. This is also indicated by the more rapid growth of the tumor, which attained considerable size in one year and eight months. This growth is rapid for an adamantine epithelioma and indicates, possibly, that the enamel epithelium found in this tumor approaches more nearly the embryonal type than that of the two preceding, which had a comparatively slow growth.

These three cysts, although they differ considerably in structure, belong to the same group, the cylindrical epithelium being their most characteristic feature, the polygonal and stellate epithelium aiding, however, in their classification. One is reminded in examining these growths of different stages in the development of the enamel organ. Falkson, as early as 1879, suggested that these growths developed from cells entering into the formation of the enamel organ. This theory was later demonstrated to be correct by Malassez, who found that only a few of the epithelial buds developing from the invagination of the gingival mucous membrane were used in the formation of the enamel of the temporary and permanent teeth. Groups of enamel epithelium are normally found in embryonal and adult jaws which are irregularly distributed from the roots of the teeth to the under surface of the gum. These masses of epithelium probably correspond to the enamel anlagen found in animals which regenerate a number of different sets of teeth. Malassez gave the name of débris épithéliaux paradentaires to this paradental epithelium from which these tumors, reproducing in their growth different stages of the enamel organ, develop.

Several other theories, which have neither an anatomic or pathologic basis, have been advanced to explain the origin of these growths. Büchtemann suggested that these tumors developed from ingrowths of gingival epithelium into sinuses or along the roots of carious teeth. His suggestion was accepted by Eve and Trzebicky. It is difficult, however, to see how such complicated growths as these could develop from ingrowths of ordinary buccal mucous membrane, the ordinary squamous cell carcinoma being much more apt to form on such a base.

Diday, Nélaton, and Guibout believed that these growths developed from the simple follicular cysts, but as Malassez states this theory may account for the origin of some cysts with few cavities, but does not explain the development of growths, whose cavities exceed greatly in number those of the parent cyst. In this connection may be mentioned the occurrence of unilocular cysts with a lining of adamantine epithelium. Bloodgood found that a majority of the dentigerous cysts examined by him had no epithelial lining. Two of his cases, however, had a lining of adamantine epithelium, the contents resembling those of an atheroma. Bland-Sutton states that some observers have noted the presence of an epithelial lining in follicular odontomata, but that in two recent specimens examined by him no epithelial lining was found. Barry and Preindlsberger and Wodcynski have also described unilocular and paucilocular cysts with a lining of adamantine epithelium. I believe that these cysts should be classed with follicular cysts even though they have a lining of adamantine epithelium, because cystic growths resulting from the degeneration of cells occurring in the center of epithelial columns are undoubtedly multilocular from the very beginning.

These tumors are much more common in the lower than in the upper jaw, the former being involved eleven times more frequently than the latter. This is quite remarkable when it is remembered that periosteal or periodontal cysts are much more common in the maxilla than mandible. Becker, in 1894, could not find a single case of multilocular cysts of the upper jaw. A number of cases are now recorded, two of the cysts forming the basis of this paper having occurred in the maxilla. As mentioned by Becker, early invasion of the antrum of Highmore by cysts occurring in the maxilla may have led to errors in diagnosis and the failure to recognize the true nature of the lesion.

The posterior parts of the jaws are much

more commonly involved than the anterior. In some cases, however, tumors which have reached an enormous size have taken their origin near the incisor teeth. The paradental epithelial debris is probably quite as abundant about the front teeth as the back, but the hyperæmia associated with inflammatory process, which are so common about the molar teeth, may be the exciting factor in the development of these growths and account for their more common occurrence posteriorly. Teeth are occasionally found in the cysts (Perthes, Wilks, Bernays). These teeth may be remnants of a tooth follicle surrounded by the proliferating enamel epithelium or, if rudimentary, they may be formed by the proliferating enamel epithelium, for Ollier observed a tumor of this character in a boy of fifteen in which small rudimentary teeth resembling those of a rat had developed in scar following a previous operation.

Although these tumors may occur at any age they are most common at or past mid-life, which clinical fact is used by Bland-Sutton as an argument against their origin from epithelial vestiges of the enamel origin for as he says they should then be more common in early life than they are. The average age of the 70 cases reported in the literature is 33. It is difficult, however, to determine the exact time at which the growth began to develop in some cases for frequently an indefinite history extending over periods of ten, twelve, and fifteen years can be elicited. Massin has observed a congenital tumor of this class, while Coote has observed one in a child of six months of age and one in a man of 75. While these tumors may occur at any age they are more apt to develop in mid-life as previously stated, and this may help in differentiating between them and follicular cysts, which, with the exception of those developing about the wisdom teeth, usually develop at an earlier period.

It is often difficult to recognize these tumors early in their clinical course for they have no distinctive features which enable one to differentiate them from a number of growths which are common within the jaw. In advanced cases a mistake in diagnosis could scarcely be made for the clinical history and the physical characteristics would enable one to exclude almost any other lesion. A multilocular cyst may exist for a number of years without affecting the general health of the patient. Cases have been reported in which the tumor has existed 26 and 29 years without giving rise to any distressing symptoms, the patient seeking surgical aid because of the size of the tumor or for cosmetic reasons. In seventy cases the average time between the beginning symptoms and the removal of the growth has been eight and one-half years. While such a growth may enlarge quite rapidly in the early part of its development it may later become stationary and remain so, as in the patient described under case 1.

The mucous membrane covering these growths is usually perfectly smooth and not ulcerated. Of course, there are numerous exceptions, but whenever the mucous membrane is ulcerated, it is due to inflammatory changes in the cysts, infection occurring accidentally through adjacent teeth or following aspiration or incision of the cavities. The lymphatics are not involved even when these growths have existed for long periods. No other growth occurring within the jaw can reach such a size as these without being associated with ulceration of the mucous membrane, involvement of the lymphatics or infiltration of surrounding tissue. The cystic nature of the growths can easily be determined by palpation of the large cysts. Often "parchment-like" crackling is an important diagnostic sign. When these tumors appear upon the gums, especially if solid, it may be impossible to differentiate them from epulides. If the tumor has developed rapidly, as is apt to be the cases in young patients (cf. case 3), it may be impossible to make a positive diagnosis before an exploratory incision is made. Small solid adamantinomas, precursors of multilocular cysts, may be mistaken for osteomas, and cystic growths for simple cysts of the jaw, or if it is not known that the growth has existed for some time for soft, central sarcomas. An X-ray picture should be an important diagnostic aid in these cases, as it should reveal the multilocular nature of the tumor early in its course. The smaller cysts are not, however, always shown, for in Fig. 1, an X-ray picture of the tumor described under case 1, but few of

the many cysts of which the tumor is composed are shown. A single unilocular cyst is usually a follicular cyst, and multiple cavities are indicative of an adamantinoma. An X-ray picture should enable one to differentiate between multilocular cysts and sarcomas. In a number of cases, however, it is practically impossible to make a positive diagnosis until a cyst is incised and the character of its wall observed. The reddish gray or gray granular membrane of multilocular cysts, often studded with small papillary outgrowths, can hardly be mistaken for any other anatomic structure occurring within the jaw.

It is quite possible that mistakes in microscopic diagnosis might be made notwithstanding that the histology of the growths is quite typical. If the interlacing, narrow, and wide columns of epithelial cells are abundant, the tumor might be mistaken for a carcinoma, but the character of the epithelium should prevent such a mistake. If the stroma is very cellular, a diagnosis of a sarcoma might be made, if an area in which no epithelial columns were present were examined.

As would be expected from the clinical course of these growths, which is essentially benign, the prognosis following operative procedures is good. Recurrences are common, but even in cases in which the tumor has recurred two or three times, the recurrences are usually local and there is no involvement of regional lymph nodes. The recurring growth, as a rule, reproduces the histology of the primary tumor. They show no more tendency to malignancy when they recur than do febromas which have been but partially removed. Heath has reported an interesting case in which, after repeated recurrences and extirpations, a round cell sarcoma developed from the stroma of the cyst resulting in multiple metastases and death. Bloodgood has reported twelve cases of growths of this character. One was considered to be inoperable. In eleven cases the diseased area was resected. Nine of the eleven patients have remained well from one to twelve years, one had a local recurrence but has remained well eight years after the second operation. One died of lung complications which followed removal of the growth. Isolated cases are reported in the literature in which tumors of this type have formed metastases but some doubt exists in nearly all cases as to the exact nature of the growth. Hutchinson, for example, reports metastatic growths in the lymph nodes adjacent to the adrenal glands in a case of tumor of the jaw, which is supposed to have been an adamantinoma; the patient dying eight days after operation of bronchopneumonia. This case, cannot, however, be accepted without reserve, for the tumor had pursued an exceptionally rapid course, attaining considerable size in three months.

The resection in all cases should be carried wide of the growth. It is practically impossible to enucleate these cysts as small cysts or solid enamel epithelium, which will later form cysts, will be overlooked. Curettage of the lining membrane offers no guarantee of permanent cures. When the tumor invades the antrum of Highmore it may be possible to resect the alveolar border of the maxilla surrounding the downward projection of the growth and after opening the antrum to enucleate the mass. This procedure was successfully employed in the case operated upon by Dr. Bevan.

The inefficacy of conservative methods is demonstrated by the number of recurrences which have followed enucleation, curettage, and destruction of the cyst by the actual cautery and caustics. Partial resection may be attempted if the cyst is small. Letenneur's experience, however, indicates that epithelial rests may remain even after fairly extensive resection. In performing a resection he left the lower border of the mandible to act as a bridge between the resected ends. Eight years after a cyst formed in this bridge. An attempt was made to destroy the growth with an actual cautery, but the growth soon returned.

If the bone has been destroyed by the growth or if the tumor has reached a large size, a typical resection will be necessary. Multilocular cysts of the jaw rarely become inoperable because of their size, because in most instances the growth can be considerably reduced in size by aspiration of the fluid contents.

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THE DIAGNOSTIC VALUE OF DISTENTION OF THE RENAL PELVIS, THROUGH THE URETERAL CATHETER[1]

BY LEONARD FREEMAN, M. D., DENVER, COLORADO

ANYTHING which lessens the difficulties of abdominal diagnosis is of importance, and especially is this true of the right lower quadrant, where the confusion of affections of the kidney with those of the appendix, gall-bladder, and uterine appendages may lead to serious errors in the placing of incisions and the relief of symptoms. I have met with many instances in which the removal of the appendix was performed or contemplated when the trouble really lay in the kidney (usually an intermittent hydronephrosis, tuberculosis, or even a stone), and sometimes operations are done upon the kidney when the appendix is at fault. The same proposition is true of the gall-bladder, the tube, the ovary, and certain less common pathologic conditions in the right or left side of the abdomen. This confusion, I am convinced, is more common than is generally appreciated especially in chronic cases without the presence of fever. This is readily understood when one remembers that the pain and even the tenderness of kidney affections is often felt at McBurney's point or under the ribs near the gall-bladder; while the urine may be almost or entirely negative. Perhaps the greatest difficulty lies with intermittent hydronephrosis, the attacks of which come at intervals, like the exacerbations of chronic appendicitis or gall-bladder trouble, when the kidney is not sufficiently enlarged to permit of its palpation. These attacks are due to occasional obstruction to proper drainage, from kinking of the ureter, or other causes. Recent observations have shown this obscure disease to be much more common than was formerly supposed, at the same time emphasizing the difficulties en-

[1] Presented at the Colorado State Medical Society, September 16, 1909.

countered in its diagnosis. There can be no doubt that it has been the cause of many operative errors, one of which, I am sorry to say, lies at my own door. This was a case which came to me some years ago, from a neighboring State, with a history of repeated attacks of what appeared to be appendicitis, the diagnosis having been positively made by the local physician and confirmed by one of the best diagnosticians in Colorado. In these attacks there had always been pain, tenderness and rigidity in the right iliac fossa, with nausea and vomiting and some rise in temperature, and but little if any disturbance in the region of the kidney itself. When I saw him, between the attacks, the urine was practically normal and there were no renal symptoms; so the appendix was removed without hesitation, a moderate abnormality being considered evidence that it was the cause of all the trouble. After the patient returned home, however, the attacks continued exactly as before (is there a surgeon who has not had this embarrassing experience?) and it finally became necessary to remove a hydronephrotic kidney that had meantime become infected and filled with multiple abscesses.

Fortunately a method has lately been suggested by which such mistakes can be avoided in obscure cases. This consists in passing an ureteral catheter up to the kidney by means of a cystoscope and dilating the renal pelvis with a solution of salt or boric acid. If the pelvis contains much more than it normally should, a corresponding degree of hydronephrosis must be present; and in addition, as soon as the pelvis is completely filled, pain is produced, which serves to locate the seat of the trouble, in that it does or does not correspond to that from which the patient has previously suffered. For instance, a woman was referred to me not long since with a movable right kidney producing, supposedly, much disturbance in the right side which incapacitated her for her various duties. There seemed to be little if any question regarding the diagnosis; but, largely for the sake of mere experience, I dilated the renal pelvis with a solution of boric acid. When the distention became great enough to produce pain, to my surprise this was totally different from that usually experienced by the patient, her habitual pain being lower down, in the region of the appendix. I hence concluded that the trouble was not in the kidney, but in the appendix, this view being confirmed by subsequent operation.

In another case, a woman complained of a very annoying intermittent pain in the left iliac region, extending up into the back towards the kidney. A renal difficulty being suspected, the ureter was catheterized and the pelvis of the kidney distended with normal salt-solution. The pain produced was entirely different from her usual discomfort and was located in the back over the kidney itself. This resulted in a pelvic operation with the removal of a diseased tube and an ultimate cure.

It is very satisfactory to note the promptness and accuracy with which patients locate the pain produced by a distended renal pelvis. There is no doubt about it and no suggestions have to be made. They often say "There, that is just like my old pain;" or "That hurts me, but it is not like I have always felt before." Sometimes the discomfort is considerable, but it soon wears away, as the kidney empties itself, and no harm results.

As with other means of diagnosis, excessively nervous or hysterical individuals may be difficult to deal with, and it is possible that erroneous conclusions might be reached; but this does not occur often and affects the general usefulness of the procedure but little. With children many difficulties exist, relating to the use of the cystoscope, the impossibility of controlling the patients, and the unreliability of their statements.

In further illustration, I was not long ago consulted by a woman who had been excessively annoyed for a long time with pain rather low down in the right side of the abdomen, combined with irritation of the neck of the bladder. Examination of the urine, an X-ray picture of the kidney, and a skin-test for tuberculosis revealed nothing of importance. She had been in the hands of several excellent physicians who had variously diagnosed ovarian trouble, a tubal lesion, and appendicitis, while one had frankly confessed himself completely at sea. Fortunately it occurred to me to dilate the renal pelvis, which contained vastly more

than normal, and immediately all the symptoms were reproduced, just as they had always presented themselves, thus demonstrating the presence of intermittent hydronephrosis, relief being obtained by subsequent operation.

There is some difference of opinion as to the normal capacity of the renal pelvis, but it can be said with certainty that when it contains over 50 cc. hydronephrosis exists, this being usually accepted as the proper standard. Kelly and others, however, affirm that anything over 7 to 10 cc. indicates a pathologic condition, and the writer has found, in numerous instances, that pain is produced in the normal kidney by the insertion of this amount of fluid. For obvious reasons, however, it is best to accept this latter diction with caution for the present, at least.

The technique of the procedure is simple enough, if one has had some practice with the cystoscope, and is devoid of danger, providing the ordinary rules of asepsis are observed. The end of the catheter must be inserted completely into the renal pelvis and not simply into the ureter. The solution must be warm and should be slowly injected so as not to cause renal colic prematurely. If the fluid is strongly tinged with methylin-blue, the mouth of the ureter may be obscured through the cystoscope during the process of injection so as to make sure that too much of the solution does not escape around the catheter, which, however, is seldom the case.

In injecting the solution, a syringe may be used with a metal plunger, to facilitate sterilization, and with a small pointed tip that will fit accurately into the ureteral catheter. It should be of considerable capacity and graduated in cubic centimeters.

I have employed this valuable aid to diagnosis in numerous cases with the greatest satisfaction, and I am sure it has assisted me in avoiding incorrect conclusions on several occasions. I desire to add my testimony to the proposition that, if it were more often employed in obscure abdominal and renal cases numerous mistakes would surely be avoided.

PREMATURE MENOPAUSE[1]

A Study of Cases from Dr. L. J. Ladinski's Clinic at Beth Israel Hospital

By M. M. STARK, M.D., New York City
Attending Gynecologist Beth Israel Hospital Dispensary; Attending Surgeon Mt. Sinai Hospital Dispensary

MENOPAUSE is a term which is commonly given to a collection of phenomena appearing in connection with the cessation of menstruation, and comprehends the whole process of senile involution of the generative organs. These phenomena manifest themselves over a period varying from 1 to 5 to even 10 years, after which there is usually a period of steady decline. Anatomically, the generative organs — internal and external — and the breasts are the first seat of the involution processes, and later the whole body takes part in it. These anatomical changes have been classified by Currier as follows:

1. Changes, the result of menopause.
2. Changes, the cause of menopause.
3. Changes, coincident with menopause.

All authors are agreed that the first changes noted as the result of menopause appear in the ovaries. Here there is a slow atrophy — the epithelial elements giving way to connective tissue growth — resulting in death of the graafian follicles, loss of nerve, artery, and lymph supply, with the production of scars in the tunica. Progressive with these, there is noticed in the uterus, at first congestion and hyperplasia, followed by atrophy, the uterine atrophy appearing later than the ovarian. The Fallopian tubes shrink and become shorter,

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the fimbriæ gradually disappear, the vault of the vagina contracts, the vagina becomes shorter, the introitus undergoes narrowing and the character of the glandular secretions becomes changed, their quantity also diminishing; the pubic hairs become straighter, the labia minora contract and sometimes disappear; the mammary glands begin to shrink, frequently only after a preliminary fatty enlargement.

In a remarkable series of autopsies on females of all ages, performed by Dalton while engaged in an extensive study of the corpus luteum, the different changes in the uterus and ovaries, described above, were actually noticed.

The anatomical changes which produce menopause are mostly to be found in the ovaries. Börmer, commenting on the relationship between early development of menopause and well marked atrophy of the uterus, states that to attempt to establish such a relationship on a scientific basis seems unwarranted. He regards atrophy of the uterus as a sequel. On the other hand, degeneration of the parenchyma of the ovary, by benign or malignant neoplasm, plays an important rôle in the production of early menopause.

It is not the object of this paper to deal with any of the pathological features preceding, attending, or following the menopause, but rather to call attention to a condition which occurs in otherwise healthy subjects when menstruation ceases for good at or before the age of 30. Only such cases are included, where the periods, which hitherto recurred in a normal or abnormal manner, cease permanently, without being affected by external or internal influences, and without the occurrence of any previous or subsequent disturbances of the economy, or without the objective demonstration of any disease. The series herein recorded presented themselves in patients who in every way seemed to be perfectly well; in fact, at the time of first observation, they were invariably in better physical condition than before, most of them having become more robust than when menstruation existed. In this respect, they are not unlike other women, who having arrived at a normal menopause, show a tendency to become obese.

As to the usual age at which menopause is arrived at, statistics are plentiful. Tilt estimates it occurs normally between 40 and 60. He reports one case that menstruated irregularly up to the age of 61, and cites another where the function persisted up to 70 years, after a cessation of 12 months. Currier cites 10 other cases between 60 and 93. Robinson reported one case in which menstruation ceased at 50 only to reappear one year later and continue up to the 70th year. The one case of a nun, who at 100 began to menstruate regularly for three years thereafter, is a case frequently cited from the "Saxonia" as illustrative of the latest menstruation. Scanzoni, however, is of the opinion that any menstruation after 53 should be looked upon as pathological.

The following table collected by Krieger gives at a glance the averages estimated by various authors from a large number of cases.

Mayer,	in 13,471 cases, average age was 50
Tilt,	in 9,780 cases, average age was 50
Guy,	in 11,250 cases, average age was 45
De Boismont,	in 9,944 cases, average age was 40
Courty,	in 14,045 cases, average age was 45
Puech,	in 11,594 cases, average age was 50

Estimating further from their statistics it was noticed that

(a) ½ of all the cases occurred between 45–50
(b) ¼ of all the cases occurred between 40–45
(c) ⅛ of all the cases occurred between 35–40
(d) ⅛ of all the cases occurred between 50–55

thus bringing the largest number of cases between the 45th and 50th years, the second largest between 40 and 45. Such voluminous statistics are convincing. In the literature, a number of cases of late menstruation are cited, but as these are unusually rare and foreign to the subject matter of this paper, they are not noted in detail. Battey, Piron, and Kisch each reports one or more cases. It is certainly a matter of much doubt if any of these cases is really a true case of late or protracted menstruation; Scanzoni, who collected much material, has probably said the last word on this subject when he stated that any menses after 53 was due to some pathological lesion. This statement offers an excellent working rule in gynecological practice.

Interesting also in the whole matter of menstruation in its many phases, is the question of its period of occurrence or duration. Most authors agree that the earlier it begins the longer it is likely to continue. The average duration estimated by Tilt is 32 years. The

following interesting table, compiled by Hanover from a total of 277 cases is cited by Tilt:

No. Cases	Beginning	Cessation	Years
5	12	47.80	35.80
18	13	45.89	32.89
15	14	44.98	30.98
34	15	45.56	30.56
38	16	45.13	29.13
36	17	43	26
49	18	44.96	26.96
33	19	44.79	25.79
28	20	45.36	25.36
10	21	44.10	23.10
4	22	43.50	21.50
3	23	44.33	21.33
4	24	39.50	15.15

Menstruation that ceases before the age of 40 is irregular, still many indeed are the instances where it does so cease, the patients continuing in good and excellent health thereafter. For the purposes of classification, a menopause occurring between the ages of 30 and 40 is considered early, that after 40 as normal and that before 30 as premature. Of the latter I have collected 11 cases from the clinical material in Doctor Ladinski's service at the Beth Israel Hospital Dispensary, appearing in the years 1907 and 1908. I have been able to collect 48 cases from the literature on this subject. Of these 48, Ed. Krieger cites the following 35:

De Boismont 2, Courty 1	at 21	3
Mayer 2	" 22	2
Krieger 1	" 23	1
Boismont 1	" 24	1
Mayer 2	" 25	2
Boismont 1	" 26	1
Tilt, Guy, Boismont, 1 each	" 27	3
Guy, Boismont, Courty, 1 each	" 28	3
Mayer, Boismont, Courty, 1 each	" 29	3
Mayer, 5, Tilt, 10, Guy 1	" 30	16
		35

To which I have collected and added:

Mundé, Montgomery, 1 each, Stark 2	at 26	4
Walter, Stark, 1 each	" 23	2
Felty, Napier, Stark, 1 each	" 30	3
Schalit, Stark, 1 each	" 21	2
Frazer, Stark, 1 each	" 19	2
Kisch, 1 case	" 17	1
Kisch, Dalton, Stark, 1 each	" 20	3
Napier, 1 case	" 29	1
Foster, Currier, Stark, 1 each	" 28	3
Stark, 1 case	" 18	1
Stark, 1 case	" 22	1
Stark, 1 case	" 24	1
		24

On rearranging both these lists, and taking in all the cases collected, we have as follows:

Menopause at	Cases
17 Kisch	1
18 Stark	1
19 Frazer, Stark, 1 each	2
20 Dalton, Kisch, Stark, 1 each	3
21 Schalit 1, Boismont 2, Courty 1, Stark 1	5
22 Mayer 2, Stark 1	3
23 Krieger, Walter, Stark, 1 each	3
24 Boismont, Stark, 1 each	2
25 Mayer	2
26 Montgomery 1, Mundé 1, Boismont 1, Stark 2	5
27 Tilt, Guy, Boismont, 1 each	3
28 Foster, Currier, Guy, Boismont, Stark, Courty 1 each	6
29 Mayer, Boismont, Courty, Napier, 1 each	4
30 Mayer 5, Tilt 10, Guy 1, Felty 1, Napier 1, Stark 1	19
	59

Wherever recorded in these cases, the examination of the genitals reveals conditions not dissimilar to those appearing at normal menopause. Whether or not these latter conditions are the result or the cause of menopause is not at all clear, unless we accept the findings of Dalton. His investigations, previously referred to, point out the progressive changes in the uterus and appendages, before, during, and after "change of life" and in various conditions of bodily disease. The case of the prostitute (cited in the list above) who ceased to menstruate at 20, showed atrophy of uterus and ovaries. Such atrophy is undoubtedly the rule in most of the cases of prematurity — it proved to be so in all of our own reports. Dalton, in his pathological series, has brought out the fact that the first signs of atrophy began in the ovaries, and became quite marked before the uterus would begin to diminish in size. This fact seems to lead to the inevitable conclusion, that the different forms of atrophy of the uterus, in their relations to accompanying amenorrhœa or menopause, are dependent for their primary cause on preceding changes in the ovaries. In this light, the uterine atrophy is a secondary change, and not a cause, and thus, the uterus comes to be regarded as the retrograde metamorphosis of a gland which has become functionally useless.

The changes, therefore, in the ovarian parenchyma are important factors in the ques-

tion under consideration. It has been observed for instance, that in acute febrile diseases and in the exanthemata, the parenchyma of the ovaries suffered sympathetic changes, and in the severe onsets these same primary changes in the ovaries resulted in a cessation of menstruation. Courty (quoted by Walter) cites three cases when menopause ensued after cholera.

That hyperplasia resulting from frequently succeeding pregnancies should result in early menopause is evident, when we consider the inevitable retrogressive changes following such hyperplasia; namely, cirrhosis. Such is the case reported by Mayer, where there were six full term pregnancies in rapid succession, menopause ensuing at age of 29. Here too, the defective innervation due to the anæmia of numerous pregnancies stands in causative relation.

Such agencies as peritonitis, acting from without, as well as the excessive involution seen in lactation, are given as etiological factors. Munde's case, menses ceasing at 26, is cited as applicable to this latter cause. Walter thought that the atrophy of the ovary was due to atrophy inhibition or disease of a local menstrual ganglion and nerve plexus, rather than disease in the organ itself.

That psychical influences should have a permanent damaging effect on the menstruating mechanism is indeed a remarkable feature. Still the fact that such is the case seems to be positively established in a few of the cases collected. Incidents, subjecting the patients to sudden fright, or affliction, or severe pain, do very frequently interfere with the normal phases of the menstrual cycle, is so far as to retard its progression or modify temporarily the intervals between cycles. They also permanently interrupt the function. Walter's case, reported 19 years after its occurrence, was in an unmarried individual of 23, who, after hearing the shocking news of her mother's sudden death, ceased to menstruate. The two cases of Tilt, both due to sudden frights, are further illustrative of this causative factor. Though shock and fright are not considered as resting on a scientific basis, many authors, including Schröeder, Stephenson, and Kisch, have included these agencies in their summaries of all causes.

Where advanced tuberculosis and diabetes show predilection for the generative organs, or following severe dysentery, the whole organism is so undermined that it is not at all surprising that the function of menstruation, so often looked upon as the expression of good health, should be wholly or temporarily suspended. But in the cases cited above, there is no co-existing disease or defective generative organs, and menstruation does cease, the patients continuing in good health and even becoming pregnant. Mayer's case No. 3, and our own case No. 8, illustrate this. This continuance of ovarian function, independent of menstruation or prolonged after its cessation will be referred to again in a succeeding paragraph.

Börner and others give heredity as an occasional cause of prematurity. In Schalit's case, reported to substantiate this fact, the patient ceased menses at 21, after having had two living births — her mother ceased at the age of 33.

Obesity was thought by Kisch to be the cause and not the result of early cessation. Currier, who has given this subject much attention, states it as a rule to be a constant one, that a woman under 30 who becomes obese, usually suffers from amenorrhœa or oligo-dysmenorrhœa (where otherwise menstruation was not painful) and in addition, is usually sterile. It is a noted fact that a great many women begin to take on fat at or after the menopause, in other words, at a period coincident with sterility. This fact is a feature in many of the cases cited in this paper. This tendency seems to have been the rule in nearly all of our cases and in most of those where the matter of the physical condition was mentioned by other writers, these patients proffering the statement that since menopause began, they have become stouter and even obese, and furthermore, that they never felt better.

Sterility and amenorrhœa, and especially in the menopause, are matters concerning which the patients with early cessation are most likely to seek advice. Though menopause is usually looked upon and really is the termination of the childbearing period, literature abounds in numerous instances in which preg-

nancy occurred after complete cessation, and this too, not only in the early cases, but also in the typical ones; namely, those occurring after the forty-fifth year. Illustrative of this latter class are two cases reported by Currier, those of Puech, Kisch, and Krieger. Piron tells of a woman who aborted a two months' fœtus at the age of 72. Mayer reports a case where menopause intervened at the age of 22, and a child was born three years after. Walter reports a case of absence of menstruation for three years after a normal labor and then a pregnancy after one reappearance of the function. Evidently ovulation bears no relation to menstruation, else we could not account for pregnancy occurring during lactation, in girls who have not yet menstruated, and in the Esquimaux, who have amenorrhœa during the winter months (case 8 of our series, had a child 3 years after cessation). In Tilt's series of 49 cases of menopause between the ages of 29 and 39, there was an average of 3 children in 26 married women; of the eight married ones in our series, 4 bore children.

The incidence of 11 cases, out of a total of 3,301 who presented themselves at our clinic in the years 1907 and 1908, would indicate a frequency of 1 in 300, by no means an insignificant percentage. The causes for early menopause, cited by other authors; namely, fright, oöphoritis, tuberculosis, and diabetes, cholera, severe anæmia, and hyperinvolution processes following super-lactation and rapidly recurring pregnancies, do not figure in any of our cases. These latter seem to be from the outset types of irregular and scanty menstruation, in which the ovarian function has worn itself out, so to speak, without impairing the health of the patient. Whether due to a defective development in the generative organs cannot be positively gainsaid; yet it is difficult to look upon any of these cases in any light other than they present unnatural conditions due to disorder, defect, or disease of some kind. It is true, however, that absence of previous or subsequent local or constitutional diseases is the rule in a great many instances (cases of Napier, Tilt, Mayer, Montgomery, Walter, and our own). The following are brief histories of the list of cases:

Foster. Sudden cessation at 28 in a previously healthy individual, after "taking cold"; subsequent health did not seem to be so good; developed Addison's disease 10 years later.

Dalton. Prostitute, died at 21 of cardiac disease; menses ceased at 20: ovaries described as very small.

Currier. Cessation at 30, ascribed to involution atrophy, due to rapidly succeeding pregnancies, seven in number.

Montgomery. Menses began at 14, regular but scanty and gradually getting less, finally ceasing at 26; married at 23, when she weighed 98 pounds; reported at 27 when she weighed 170.

Bloom, in a series of 400 cases, gives the earliest menopause as having occurred at 29; no history of case.

Börner. Menstruation began at 16; at 26, after a normal labor, menses reappeared eight weeks later, but stopped on third day; no show for four years (time of report of case; no subsequent report).

Mayer's cases. 1. Menses at 14, ceased at 25; married at 27. Sterile. Examined when 39; uterus small.

2. Menses at 13, married at 16 and had six children and one miscarriage; menses ceased at 29 without cause. Patient began to get stouter and never felt better.

3. Menses at 13. Had 5 children between 17 and 28; had not menstruated since age of 22. Examined when 33.

4. Menses began at 14, married at 20, child at 21; no menses after 22d year; observed for 10 years.

5. Menses at 13; married at 20; in fourth year of wedlock had two children; menses ceasing after second birth; supposedly after "severe fright." The patient became idiotic and epileptic, though previously healthy.

De Boismont's cases. 1. Menses at 16; two children; profuse hæmorrhage at 27; no reappearance; partial paralysis following.

2. Menses at 10½; cessation at 28; well when seen at 46.

3. Menses at 16; regular up to 21; four children before this; 9 days after last confinement, husband died suddenly; lochia ceased; no return of menses when seen at 37.

4. Menses at 13; married shortly thereafter; four children, last one at 21. After fright, menses suddenly ceased; jaundice for few months thereafter; not at all well subsequently.

Courty's three cases ceased at 30, following severe cholera. Two were reported well after 10 years, the third after 15 years.

Krieger. Menses at 13; regular but scanty; had retroflexion. Menses once in 21st year; thrice in 22d year, and cessation at 23. Uterus described as atrophic.

Tilt reports 10 cases with menopause at 30 and one at 27. Details of only three of these are given:

1. Ceased at 30; still nursing a baby of 16 months. Husband dropped dead in her sight; "stunned by blow."

2. Regular menses up to 30; threw a dead rat out of window, thinking it a coal; no menses for four years.

3. Sudden disappearance at 30 after a fit; no menses when investigated 12 years later.

Guy in a series of 300 cases, reports 3 cases, occurring at 27, 28, and 30 respectively; but gives no history. He says, however, that he has included no case due to severe disease.

Mundé reported one case following excessive involution after confinement, at age of 26; no subsequent history.

Walter. Menses at 11; unmarried; owing to severe shock, menses ceased at 23; remained well thereafter; reported when patient was 43.

Felty. Cessation at 30; no history details.

Schalit. Ceased at 21, after two living successive births; menses at 14; reported when patient was 33; uterus described as small. (Had severe hæmorrhage during second pregnancy and at parturition, but remained well after menopause.) (Mother of this patient ceased menstruating at 33.)

Frazer. Menses at 15; married at 18; ceased at 19; sterile; only one menstruation after marriage.

Kisch has two cases. 1. Menses at 9; married at 15½; fat and growing fatter (obesity here given as the cause of menopause). At 17 noticed diminution and then cessation. Sterile.

2. Menses at 13; married at 16; ceased at 20; sterile.

Napier. 1. Menses at 14; married at 26 and had a child, which was not nursed; after this menses became scanty and gradually diminished, finally ceasing at 30.

2. Ceased at 29; virgin; regular until 16; irregular and scanty between 16 and 28; ceased at 29; became stouter.

Our own cases, which follow, are selected from all those who applied at the clinic during 1907 and 1908 and include only those either observed two years or more, or those in whom the menopause was absent for a period longer than four years before seeking advice. Among these new cases (numbering in all 3301) there was a number in whom menstruation had ceased and in whom the characteristic atrophied uterus was present, but the period of observation was considered too short to include these cases in the present report.

In none of our cases are any of the causes present for early cessation such as figure in other cases; rather is the cause unassignable. In other words, ours are simply pure cases, *per se*, of premature menopause.

Case 2. No. 2, 653. B. L., age 28; married 6 mos.; menses regular until two years ago.

Case 3. No. 1. C. W., age 38; menses at 14; irregular and scanty until 23; menses not seen again until 29 (which was one year after marriage) and continued regulary for one year; not seen since that time.

Case 4. No. 29. B. F., age 30; menses at 13; married 6 years; 3 children; youngest 4 years old. Menses ceased 10 months ago, reappeared 6 months ago and continued monthly for 3 periods, then ceased entirely (i.e., 2½ years ago), uterus atrophic.

Case 5. No. 311. S. C., age 19; menses at 15, continuing for 6 months, when it ceased entirely; breasts well developed; uterus atrophied.

Case 6. No. —. R. M., age 28; menses at 13; then absent for one year; irregular on its return; married at 23; appeared twice at 6 months' intervals since then; one child 12 years ago.

Case 7. No. 109. R. B., age 32; menses at 13; regular until 20; married at 24; no menses in 12 years, is now 190 pounds and getting stouter.

Case 8. No. 167. M. D., age 27; began at 17; regular until 4 years ago; not since then; married 5 years; one child a year ago; growing stouter.

Case 9. No. 466. D. D., age 29; menses at 13; regular up to 3 years ago, when last child was born; not since then; married 13 years; 2 children.

Case 10. No. 550. Y. C., age 23; menses began at 13; regular up to 2½ years ago; not since; feels perfectly well; getting stouter.

Case 11. No. 2,035. R. F., age 23; menses at 14; regular until 5 years ago; then at irregular intervals until 3 years ago, when it was absent for 1½ years; then reappeared for 3 months and is now absent for 15 mos.; taking on flesh past 4 years, always was thin.

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CHANGES IN THE NORMAL ENDOMETRIUM DURING MENSTRUAL LIFE, BASED UPON THE STUDY OF ONE HUNDRED CASES

By C. C. NORRIS, M. D.,
Instructor in Gynecology, University of Pennsylvania; Attending Physician to the Maternity Hospital; Assistant Obstetrician and Gynecologist to the Philadelphia General Hospital

AND

F. E. KEENE, M. D.,
Instructor in Gynecology, University of Pennsylvania, and Assistant Gynecologist to the University Hospital
(From the Laboratory of Gynecological Pathology, University of Pennsylvania.)

IN our preparation of this work, we have reviewed the histories and examined the curettings of the patients operated on in the gynecological clinic of the University Hospital during the last ten years, accepting only those in which no lesion, such as fibromyoma, cysts, or inflammation was present, and in which a history of regular menstruation was given. Our study has been based upon the excellent work of Adler and Hitschmann (Monat. f. Geburt. und Gyn., bd. xxvii, h. 1), who have so clearly shown that the normal endometrium passes through a definite cyclic transformation, the complete cycle embracing the time from one menstrual period to the next; furthermore each cycle is divided into four periods; viz., post-menstrual, interval, premenstrual, and menstrual.

A hard and fast rule in the separation of these four periods cannot be established, since in the various transformations there is a gradual change observed in different portions of the endometrium and even in different areas of the same section. In our description, therefore, we will detail those findings which predominate in the period under consideration, and which may be looked upon as more or less characteristic.

We will begin with the changes observed during the post-menstrual period, since the picture presented is the simplest of the four, and gives a starting point from which the further developments may more easily be traced and better understood.

Post-menstrual period. The endometrium is thin and pale with a smooth surface. There may be scattered here and there a few subepithelial ecchymoses as evidence of the preceding menstruation, but they are never extensive.

Even the first day after menstruation has ceased, the surface is found to be covered with a continuous layer of low, narrow, cylindrical epithelium. The glandular epithelium exhibits the same characteristics. The cell outlines are distinct. Their arrangement is symmetrical and the inner contour is sharply defined and smooth. The protoplasm is relatively small in amount and takes a homogeneous pink stain. The nucleus is deeply stained, occupies a large portion of the cell, and is oval or round, although the long oval shape, extending in the longitudinal axis of the cell, predominates. The nucleus occupies either a median or basal position in the cell. In both the glandular and surface epithelium, mitotic figures are seen, the number varying greatly in different specimens.

Immediately after menstruation, the glands are widely separated, straight, running perpendicular to the surface, and extremely narrow. In some glands the inner edges of the opposing cells seem to touch one another, as the result of which the lumen is practically obliterated. Later during this period, the glands become larger and their lumina are distinctly wider. The epithelial cells are somewhat higher than those observed immediately after menstruation, and continue to present sharp outlines and a smooth inner contour. The lumina of the glands are universally empty.

The stroma is composed of spindle-shaped and oval cells, the former predominating in some sections, the latter in others. In the superficial portion of the mucosa, the cells appear to be arranged more loosely, exhibiting clefts between the individual cells, while in the deeper layers the cells are in more intimate contact, giving this portion a compact

appearance. The nuclei take the stain deeply and fill up the entire cell, although occasionally, a narrow ring of protoplasm can be distinguished. In several sections, small round cells with deeply staining nuclei are seen, occurring either scattered among the other cellular elements, or arranged in clusters. The stroma cells, as well as the epithelium, exhibit mitotic figures. Here and there may be seen the remains of hæmorrhage which has taken place during the menstruation, but these disappear a few days after the bleeding has ceased.

The interval. Toward the end of this period, the endometrium is thicker, pale, and the surface may be slightly wavy. Microscopical examination shows that the surface has lost its smooth outline, and is now thrown into small elevations. The surface as well as the glandular epithelium has become higher and broader. The nucleus is oval, extending in the long axis of the cell, is central or basal in its position, and takes a deep stain. The protoplasm stains a faint homogeneous red and is increased in amount. The cell outlines are distinct and sharp in contour. Later, as this period merges into the premenstrual, other alterations in the cells are observed. They become still higher and broader, and the inner cell contour loses, to a certain extent, its sharp outline, assuming a fringed appearance with less distinct differentiation between the individual cells. In some areas, the protoplasm maintains its homogeneous appearance, while in others it presents an inner zone which is finely granular, and an outer zone, which is homogeneous and faintly stained. The nuclei in these cells appear larger, are less deeply stained, and tend to assume the basal position. Mitosis is seen during the greater portion of this stage, which can be said to continue until ten or eleven days prior to menstruation.

The glands have now begun to take on a spiral course, and as the stage advances, this becomes more marked. Their lumina are distinctly wider and in most cases empty. In certain glands, however, the low power reveals what appears to be a red homogeneous content, which upon higher magnification is seen to consist of interlacing, closely arranged, red threads. That portion of the gland situated near the muscle does not participate in these changes.

The superficial layer of the stroma is seen to be composed of cells even more loosely arranged than in the preceding stages and consists largely of round and oval cells, while in the deeper layers the spindle-shaped elements are more abundant. There has been an increase in the amount of protoplasm and the nucleus maintains its staining properties. As in the post-menstrual stage, small mononuclear cells are found throughout the stroma, though more numerous near the surface. During the latter part of the period, superficial œdema frequently takes place.

Premenstrual period. The mucosa is greatly thickened and in certain areas may present papiliary excrescences. Six to eight days prior to menstruation, it is pale and œdematous, often gelatinous in character, but shortly before menstruation it appears somewhat congested. According to Adler and Hitschmann, the changes begin in the fundus and extend to the internal os where they are sharply circumscribed.

Microscopically the surface is very irregular, exhibiting decided elevations and depressions. The surface epithelium has become low and broad with a round, lightly stained nucleus which lies at the base of the cell, the protoplasm of which is lightly stained or transparent. Associated with these changes in the surface epithelium are seen even more marked changes in the glandular epithelium. During the first few days of this period, the epithelium becomes much higher and broader, due to an increase in the amount of protoplasm. During the early premenstrual period, the cells are arranged in one layer, while later many areas are found where the cells are irregularly stratified, appearing as if they were crowding one another for space upon the underlying basement membrane. This is especially marked at the summit of the papillary projections so frequently seen during this stage. The individual cells are not distinctly differentiated from one another, but it can be seen that their shape has become altered. The apex is wider than the base, giving a wedge-shaped appearance. The apices of the cells, in some areas, are rounded, so that the inner cell contour has lost its straight, sharp outline

and appears scalloped. In other areas, the surface of the cell projecting into the lumen appears to have been ruptured by some intracellular pressure, since fine finger-like protoplasmic projections are found, and even small pieces of protoplasm can occasionally be seen broken off from the cell. The protoplasm presents different pictures in different portions of the section. In some areas, it has an external homogeneous appearance, while the inner portion is finely granular, these granules staining a faint red. In other cells the protoplasm is homogeneous throughout, being faintly red tinged, while in still others, it appears an indistinct blue rather than red. If one compares the protoplasm of this stage with that of the preceding stages it is immediately seen that throughout the whole section, the protoplasm has lost to a great extent, its staining property. Decided changes have also occurred in the nuclei. They have assumed a round form and lie immediately upon the base of the cell. They largely maintain their coloring property, but shortly before and at the beginning of the bleeding, the stain appears lighter. As a result of the increased breadth of the cell, the nuclei are more or less widely separated from one another.

It is during this stage that the glands show characteristic changes in form. These alterations are more marked in the deeper portions of the endometrium, so that a division into a superficial compact and a deeper spongy layer can be identified. As the stage advances the glands become more tortuous, finally presenting deep multiple invaginations, often arranged somewhat regularly, giving a pleated appearance. The fundi of the glands lying in the deepest portions, i. e., next to the muscle, do not show these changes. The lumina of the glands, instead of being empty, may be seen to contain the thready, red substance already referred to in the description of the interval glands; while in others the contents consist of mucus, with a large amount of cellular debris. In sections obtained one or two days prior to menstruation, the mucus is especially abundant. In one of our sections in which mucus was present in a large number of glands, these glands have lost their irregular outline to some extent and have become more saccular. The protoplasm is stained a faint homogeneous blue, and the nuclei are oval rather than round and are more central in position.

In examining the stroma, it appears pale and œdematous, becoming more markedly so as the time of actual menstruation approaches. With high magnification it is seen that the stroma cells have greatly increased in size, due largely to the increase in protoplasm. Their shape has entirely changed, for instead of being spindle or oval, they are now polyhedral, due to the pressure they are exerting upon one another. When little or no œdema is present, the cells lie closely together while of course in the presence of much œdema, they are widely separated. The protoplasm is very lightly stained and at times appears transparent from its complete lack of stain. The nuclei have enlarged and are round or oval. In general, there has been a decrease in their staining property, but here and there cells are seen whose nuclei are deep blue. In other words the stroma during this stage resembles very strongly the picture presented by young decidua. The blood vessels are dilated and engorged with blood.

Menstrual period. Unfortunately no curettings taken during menstruation were at our disposal hence we will quote freely from the description of Hitschmann and Adler. The changes demonstrate a transition from the picture of the premenstrual to that of the postmenstrual period. After bleeding has commenced the thickness of the endometrium is greatly lessened. Microscopical examination shows that there is no longer a separation into a compact and spongy layer. The superficial epithelium may remain more or less intact showing only small clefts through which the blood has escaped. As a result of the bleeding into the substance of the endometrium, the blood may collect immediately beneath the epithelium, causing the well known subepithelial hæmatoma of Gebhard. Again there may be an extensive loss of the surface epithelium, so that even with the naked eye this can be recognized by its raw appearance; or a large portion of the compact layer may be cast off.

The changes in the glands are progressive, occurring from day to day. During the first day of menstruation they have lost to some

extent the tortuous course seen during the premenstrual stage and have become narrower — for it is during menstruation that the mucus content is thrown off. On the second or third day one sees the dilated glands still containing mucus alongside of straight, narrow, empty glands, until on the last day, the post-menstrual type predominates. These changes do not take place simultaneously over the whole endometrium, since in some areas there will be a preponderance of the dilated glands, in others of the narrow glands.

The character of the epithelium depends upon the form of gland examined. In the dilated glands the cells preserve the characteristics of the previous stage, while in the narrow glands the cells have become low, narrow, and poor in protoplasm. There is a loss in glandular as well as surface epithelium as shown by the presence of cellular debris in the glandular lumina. As a result of bleeding, the stroma of the endometrium is filled with red blood corpuscles and leucocytes. The stroma cells are separated and on account of the large amount of blood their contour is obscured.

Changes in the endometrium as the result of pregnancy. On the occurrence of pregnancy, the entire endometrium is stimulated and becomes thickened. This thickened membrane is known as the decidua. The formation of the decidua occurs very early in pregnancy. The exact date of its formation is in doubt, but in all the cases of very early pregnancy which have been reported, a more or less well developed decidua has been found. Thus a decidua was present in Peter's (Ueber die Einbettung des menschlichen Eies., Wein., 1899), and Leopold's (Uterus u. Kind., Leipzig, 1897), cases which were four and eight days' pregnancies respectively. The decidual formation is found only above the internal os, although a few exceptions to this may be met as in cases reported by Von Weiss (Cent. f. Gyn., 1897, 641) and Von Franque (Cervix und Unteres Unterinsegment, Stuttgart, 1897) in which isolated decidual cells were found in the mucosa of the cervical canal. These are rare cases and it may be positively stated that true decidual transformation takes place only above the internal os.

For purposes of study the decidua has been divided into three parts; namely, the decidua vera, which is that part of the mucosa lining the uterine cavity, the decidua basilaris or, as it is often called, the decidua serotina, which lies immediately beneath the ovum and is penetrated by fœtal elements (chorionic villi), and the decidua reflexa which, as its name indicates, forms the maternal covering of the ovum. His (Arch. f. anat. u. Physiol., Anat. Abth., 1897, 399), uses the terms decidua capsularis and basalis instead of decidua reflexa and serotina. According to Williams (Obstetrics, 109), the reflexa can be easily distinguished by the end of the first week of pregnancy and at the end of two or three weeks is a well defined membrane. As would be expected, during the early months of pregnancy the decidua reflexa does not entirely fill the uterine cavity. At about the fourth month, however, the ovum has grown to such an extent that the reflexa and vera have been brought in contact and the uterine cavity is entirely occupied by the ovum. At about this time a fusion takes place between the reflexa and the vera, after which the reflexa undergoes degenerative changes. Macroscopically the decidua reflexa is yellowish white in color and often shows small ecchymotic areas over its surface. The surface has a somewhat roughened appearance, and if examined with a magnifying glass, numerous small pits which correspond to the gland openings can be seen. As has been said, the decidua vera is a very early product of pregnancy. Due to the stimulation of pregnancy the mucosa of the body of the uterus begins to thicken so that at the end of the first month, the decidua may be .5 or even 1.5 cm. in thickness. The smooth velvety appearance of the surface of the non-pregnant mucosa is soon lost. The surface early becomes indented by numerous crypts some of which penetrate one-fourth to one-third the entire thickness of the mucosa. The gland openings which cannot be distinguished in the non-gravid uterus, can now be recognized with the naked eye as small depressions. The entire membrane has a mamelonated, cribriform appearance. At this stage it is sometimes spoken of as the lamina cribrosa.

In 1870, Friedlander (Physiol. anat. Untersuchungen uber den Uterus, Leipzig, 1870)

demonstrated that the decidua was composed of two distinct layers which could be recognized macroscopically. These consist of an upper compact or cellular layer and a deep spongy or glandular layer. The spongy layer is much the thicker. At about the third or fourth month, the decidua has attained its greatest thickness, after which period, as a result of gradually increasing intrauterine pressure, the membrane becomes thinner so that at term it measures but 2–4 mm. in depth and macroscopically the two layers can no longer be distinguished.

The macroscopical appearance of the decidua, characteristic as it may be, unless accompanied by some positively recognized fœtal element, is insufficient evidence upon which to warrant an absolute diagnosis of pregnancy. The histological recognition of the decidua is, according to the writers, sufficient grounds upon which to make a diagnosis of pregnancy. In arriving at such a diagnosis one must consider the picture as a whole, and not single elements such as a group of typical decidual cells or a typical gland. Furthermore, one must remember that the picture presented in certain specimens of endometrium taken during the premenstrual period, simulates the decidua of pregnancy very closely — in fact it may be impossible to differentiate the two when there is an early pregnancy. This is easy to comprehend, since the changes brought about by pregnancy are but a further step in the premenstrual stage.

The decidua varies at different periods of its development, histologically as well as macroscopically. For purposes of histological description and study it is easier to take up the individual elements of the decidua rather than describe a particular microscopic field.

The surface epithelium. The surface cells of the normal non-gravid endometrium are made up of ciliated cylindrical epithelium. These, as a result of pregnancy, become broader and more cuboidal, the nuclei stain less deeply. As pregnancy advances, and the intra-uterine pressure becomes greater, the surface epithelium becomes even more flattened and at term is represented by a single layer of endothelial-like cells. Klein (Zeitsch. f. Geb. u. Gyn., xxii, 247, 1891) was the first to call attention to these changes in the surface epithelium. He considered them characteristic of pregnancy. They are, however, of little importance unless associated with additional alterations of the endometrium, as similar changes are noted in conditions other than pregnancy.

The uterine glands: In the upper or compact layer of the decidua, the glands appear few in number. They are straight, narrow and compressed. As the pregnancy advances, the glands in the compact layer seem to decrease in number. In the deeper or spongy layer the glands compose almost the entire field. These glands are known as Opitz-Gebhard glands. They are large, dilated, tortuous glands, somewhat irregular in size and on cross section, as pointed out by Abel (Gyn. Path., Abel-Bandler, p. 79) are often triangular in shape. This triangular formation of the glands is present only in the compact layer. Later, as pregnancy advances and the decidua becomes thinner, the characteristic shape of the Opitz glands disappears and at the ninth or tenth month they are seen in the deeper layers of the mucosa as flattened, compressed tubules usually found running parallel to the long axis of the uterus.

The glandular epithelium, during the early months of pregnancy is of special interest. That found in the compact layer of the decidua is similar to the surface epithelium. As the dilated portion of the gland is approached, the character of its epithelium changes. It becomes somewhat higher, although still cuboidal. It is often proliferated, forming fern, ledge, or papilla-like projections into the lumen. At these points, the epithelium is variable in size and shape, being round, oval, or cuboidal, and it gives the impression of being loosely attached. The cells appear to partially overlie one another. The cell outlines are distinct, the cytoplasm finely granular, the nuclei oval or round, and the entire cell protoplasm and nuclei are less tingeable than in the non-pregnant mucosa. Occasionally a gland may be seen in which this peculiar transformation is in progress, part of the gland being unchanged and another part showing the Opitz-Gebhard proliferation. The lumina of the glands in early months of pregnancy are usually empty,

although occasionally they may contain a little mucus or cellular debris. As the pregnancy advances a desquamation begins which finally ends in a necrobiotic change or, according to other investigators, a fatty degeneration. A certain amount of epithelium, however, always remains and from it is regenerated the glandular epithelium after pregnancy.

The glandular changes, even the Opitz glands, are not absolutely pathognomonic of pregnancy, as almost similar histological pictures may be produced by other conditions. Occasionally in the non-gravid endometrium, the deepest portion of a gland will be found penetrating the uterine musculature. This portion of the gland, i. e., that part which is in the uterine muscle, does not take on any of the characteristics of pregnancy, but remains unchanged.

The decidual cell. This cell is the derivative of the stroma cell. This fact has been proven by the work of Leopold (Verh. d. deutschen Gesell. f. Gyn., iii, 257, 1890) Hegar (Monat. f. Geburtskunde, xxi. Supplement heft 1–66, 1863) and others. For some years there was doubt as to the connective tissue origin of the decidual cell but it is now accepted. The transformation of the stoma cell to the decidual cell occurs very early in pregnancy. The compact layer of the decidua is made up almost entirely

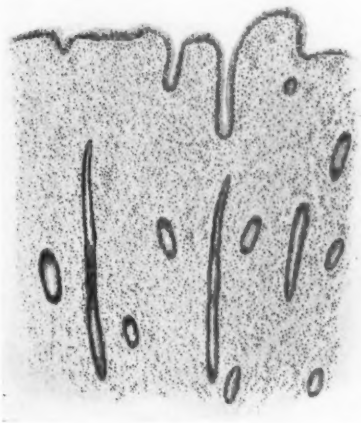

Fig. 1. Endometrium during the postmenstrual period. The glands run a straight course, perpendicular to the surface. The lumen of each gland is extremely narrow and empty.

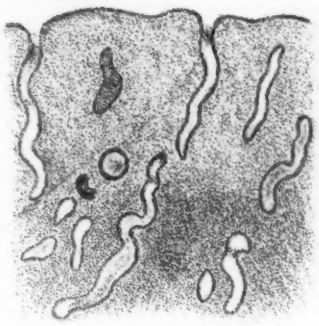

Fig. 2. Endometrium during the interval. The upper portion of the stroma shows œdema. The lumina of the glands are distinctly wider than in the preceding stage, and have assumed the cork-screw shape. Some of the glands contain a thready substance, taking the eosin stain.

of these cells. A less marked change is found in the superficial portions of the spongy layer while in its deeper portions, i. e., that portion which is in direct contact with the uterine muscle, practically no change is seen in its stroma cells. As a result of pregnancy these cells, especially those in the superficial layers of the mucosa enlarge, becoming five or six times their original size. As the cells enlarge they exert pressure upon one another and become mutually flattened, as a result of which they assume more or less polyhedral outlines. The cell outline is somewhat indistinct, but can be recognized. The protoplasm is finely granular. The nuclei are slightly larger than the nuclei of the non-gravid stroma cell. It is a characteristic of the decidual cell, that the increase in size concerns the protoplasm more than the nucleus. Occasionally cells are seen which contain two nuclei. The protoplasm stains palely and the nuclei are distinctly less tingeable than before pregnancy. The appearance of a field of decidual cells is pale and translucent and the cells which were originally spindle-shaped are now oval and have oval nuclei. Decidual cells are as a rule rather uniform in size.

As has been shown, the decidual formation is limited to the uterine cavity. It is, however, worthy of note that peculiar decidua-like areas are not infrequently found on the posterior surface of the uterus, the surface of the ovary,

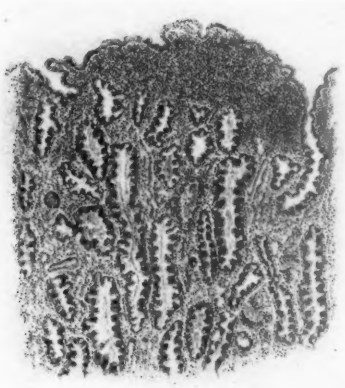

Fig. 3. Endometrium during the premenstrual stage. The superficial compact and deep spongy layers are easily recognized. The glands are irregular in shape and their lumina are still wider than those of the interval. Many of the glands contain mucus.

and in the peritoneum of the cul-de-sac. These changes have been pointed out by a number of observers, notably Schmorl (Monat. f. Geb. und. Gyn., v. 46, 1897) and Rob and Myer (Quoted by Ruge, Gyn. Diag., p. 195). Macroscopically, the areas appear as small opaque spots scattered over the peritoneum or ovary and at first glance, look not at all unlike miliary tubercles. When examined microscopically, each of these areas is seen to be composed of cells which are the prototype of typical decidua cells. They are derivatives of the peritoneal endothelium or germinal cells of the ovary and are considered as a normal reaction due to the stimulation of pregnancy. These decidua-like areas are not constant and it is better to limit the term decidua to those changes taking place in the endometrium as the result of pregnancy.

The intercellular substance, which in the non-pregnant state consists of a finely granular network, becomes less distinct. It is of the utmost importance to remember that the decidual transformation takes place uniformly throughout the entire corporeal endometrium and that the decidual cells will be found arranged regularly, often in rows, at certain relative depths in the mucosa. This is of especial importance in making the differential diagnosis between the decidua and various pathological lesions which often produce swelling and œdema of localized clusters or groups of cells. The decidua basilaris differs but slightly in its histological characteristics from the decidua vera, except that it is penetrated by fœtal elements. If the fœtus die in utero or be expelled, certain changes take place in the decidual cells which are characteristic. The cell outline becomes clear and distinct, the nuclei shrink and become more tingeable, the protoplasm becomes translucent and almost homogeneous in appearance.

Blood-vessels of the decidua. The blood-vessels of the decidua are quite different from the blood-vessels of the endometrium. The decidua is very vascular and this is especially true of the decidua basilaris. Here the vessels are present in great numbers. The

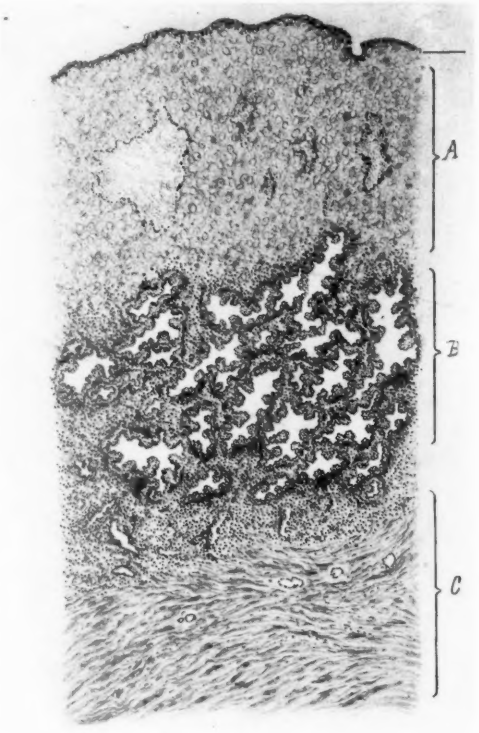

Fig. 4. The decidua of intrauterine pregnancy. A, Compact layer; B, Spongy layer; C, Muscle.

Fig. 5. Gland epithelium during the postmenstrual stage. The cells are low and narrow and the nucleus occupies a large portion of the cell. The lumen of the gland is very narrow and completely empty.

arteries pursue a tortuous, spiral course. The veins are dilated and both veins and arteries are often found penetrating the entire thickness of the mucosa. Many large sinuses are present. For a detailed description of the method of the establishment of the junction between the maternal and fœtal circulation and the intervillous spaces, the reader is referred to Peters' (Ueber die Einbettung des menschlichen Eies. Wein. 1, 899), and His' (Anat. menschlichen Embryonen, Leipzig, 1880–85) works and Grosser's excellent book, The Placenta. The vessels of the decidua are peculiar in that their walls are entirely lacking in muscular elements, being made of only endothelium which, however, is not so delicate and thin as the capillaries of the non-gravid endometrium. Occasionally large blood spaces are seen.

At the end of pregnancy, the decidua, as its name indicates, is cast off wholly or in part, either as an entire membrane or in shreds. The latter is the more common. A portion of the deeper layers always remains, and from this the process of regeneration takes place.

The decidua of extra-uterine pregnancy. Membranes are often submitted to the pathologist for a diagnosis between intra- and extra-uterine pregnancy. In tubal pregnancy, the uterine decidua may be expelled either as a cast of the uterine cavity or in small pieces. When this occurs, the differential diagnosis between an intra-uterine pregnancy and a tubal gestation can sometimes be made by the macroscopic appearance of the membrane. The decidua of tubal pregnancy is often quite thick (1 cm. or more). It may be expelled in shreds, but more commonly as one or two pieces which conform to the outline of the uterine cavity. Hence it is usually triangular in shape. The tubal and cervical openings can be easily distinguished. The outer surface has a rough, shaggy appearance and may be partially covered by laminated blood clots. The inner surface shows numerous small crypts or depressions and is often coated with coagulated blood.

The recognition of the membrane as decidua presents no difficulties, but the diagnosis between a tubal pregnancy, an abortion, or a menstrual decidua (exfoliative endometritis) is often difficult, especially since these specimens when presented to the pathologist are rarely fresh and have often been improperly preserved. If the membrane contains an ovum, the diagnosis is at once assured. In cases of exfoliative endometritis, the clinical history will be of great service. Even at best with such membranes, the macroscopic appearance of the specimen will be insufficient for a positive diagnosis and the microscope will be the court of last resort. The formation of a uterine decidua in cases of tubal pregnancy is completed at two or two and a half months.

Fig. 6. Glandular epithelium during the interval. The cells have become higher and broader and at "A" show an inner granular and outer homogeneous zone. The nuclei are well stained and are situated at the base of the cells. The lumen of the gland is dilated and contains a thready material.

Histologically, the two decidua are said to present certain differences. In the decidua of extra-uterine pregnancy, the decidual cells are smaller. The cells do not become mutually flattened, but retain almost their original oval outline. The nuclei are but very slightly larger than the nuclei found in the non-gravid endometrium. In addition to this, as the decidua is not as a rule thrown off in extra-uterine pregnancy until the death of the fœtus, the decidual cells show the characteristic changes of fœtal death. These changes have already been described. It is also claimed that the surface of the decidua, spontaneously expelled from cases of tubal pregnancy, often shows depressions. These are explained on the ground that the inner surface of such a membrane is not smooth but shows deep crypts. It is thought by Abel (Gyn. Path. Abel-Bandler, p. 84) that at the height of those fields formed by the grooves, a star shaped, divided vessel is present. The blood-vessel changes in the decidua of a tubal pregnancy are the same as those of a normal pregnancy. The compact layer contains numerous vessels, the walls of which are composed of endothelium. In the deeper portions, the vessels are larger. Near the surface, the vessels often run parallel to it and are comparatively straight. In the deep portions, they are tortuous.

Fig. 7. Glandular epithelium during the late pre menstrual stage. The individual cells are indistinctly differentiated from one another. The cells have become much broader, and their inner contour irregular. In some areas (A) the inner aspect of the cells appears broken, with discharge of their contents into the lumen of the gland. At "B" there has been a proliferation of the cells. C, Mucus.

Fig. 8. Typical Opitz-Gebhard glands, showing fern-like ingrowths of prolferating epthelium. Note that the general character of this gland is similar to that of the premenstrual stage, only in this case the changes are more advanced.

Even under the most favorable circumstances the diagnosis between intra-uterine and tubal gestation from the decidua alone is extremely difficult, since at best it is simply a question of degree, and for this reason and because of the serious consequences often dependent upon such a diagnosis, it is better for the microscopist to refuse to make a positive diagnosis in these cases unless he finds fœtal elements and even then the possibility of a combination of intra- and extra-uterine pregnancy must be borne in mind.

Intercellular substance. For the purposes of study of this portion of the endometrium Hörmann (Arch. f. Gyn., bd. 86, ii, 2, 1908), recommends Bielschowsky's silver stain. The intercellular network which has its origin from the protoplasmic processes of the stroma cells, interlace and in many cases overlie one another, forming in some areas distinct bridges. A second variety of intercellular substance consists of delicate fibrils which constitute a more or less dense reticulum or network, between the meshes of which the stroma cells are lodged. This "intercellular fibrillar collagenous fibroreticulum" as it is termed by Hörmann, varies considerably in density in different parts of the endometrium.

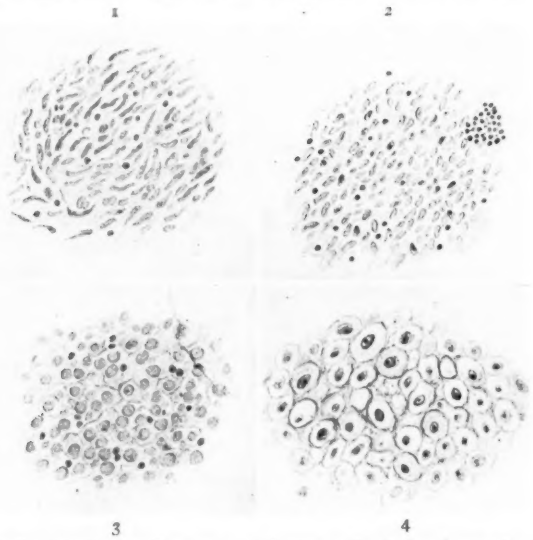

Fig. 9. 1. Stroma cells in postmenstrual stage. 2. Stroma cells during interval, showing collection of small round cells. 3. Stroma cells during late premenstrual stage. 4. Decidua cells.

The two points where it is constantly found in its greatest density are immediately beneath the surface epithelium and surrounding the glands. This constitutes the basement membrane or membrana propria of many authors. As a rule the further away the field is from any epithelium, the less intercellular material will be found. According to some investigators, the intercellular substance is formed in great abundance in the mucosa of the fœtus and child, while in the adult, the meshes are more loosely arranged and the individual fibers are coarser. A delicate collagenous fibroreticulum is present in the compact layer of the decidua.

Differentiation between endometritis and the changes found in the normal endometrium. For the last few years there has been considerable discussion as to the proper use of the term endometritis, one side claiming that the word should be applied only to those cases in which the endometrium showed distinct, active histological evidences of inflammation; the other side believing that endometritis should embrace practically all changes found in the mucosa of the uterus except actual tumor formation. This latter was the conclusion arrived at by a committee appointed by the American Gynecological Association in 1907 (Am. Journal of the Med. Assoc., 1907, xlviii, 1, 1002). Using the term endometritis in this sense, there is little doubt that numerous endometrii have been classified as glandular or interstitial endometritis, which were in reality nothing but normal cases, the tissue having been classified as glandular when examined in the premenstrual period, and interstitial when it has been removed in the postmenstrual period. If the pathologist wishes to adhere to the broader use of the term endometritis, he should know in which period the endometrium he is examining has been removed, and a knowledge of this would undoubtedly be of value in studying all cases. We have found from a study of our cases that even those endometrii which show active inflammatory changes and which are in the strictest sense of the word endometritii, possess a very decided tendency towards glandular changes if examined during the premenstrual period, and the majority of those which are classified as interstitial have been removed in the postmenstrual period. Exactly how far a thorough knowledge of the changes which the normal endometrium undergoes will extend towards doing away with the term glandular and interstitial, it is difficult to state, but it is certainly a strong argument for

the present tendency towards the simplification of the classification of endometritis into acute and chronic.

The numerous classifications of endometritis which are now in use are very faulty and a simplification is badly needed. The terms glandular endometritis, glandular hyperplasia, polypoid, fungoid endometritis, etc., are as confusing to the general practitioner as they are to the student. In the authors' opinion, it is far better to limit the term endometritis to those cases which show active inflammatory changes and to do away entirely with such terms as glandular or polypoid endometritis, adopting simply the terms acute and chronic. It is well known that, apart from the physiological change found in the endometrium, the various inflammatory processes which are known as polypoid, fungoid, glandular endometritis, etc., are not distinct conditions but are variations in a common process.

Throughout this paper the term endometritis has been used as signifying the mucosa of the body of the uterus. When the cervical mucosa has been mentioned it has been referred to as cervical.

CONCLUSIONS

1. The endometrium in the normally menstruating woman undergoes a complete and definite cycle every twenty-eight days.

2. For the purpose of study, this cycle is best divided into four periods which blend into each other. During the period which constitutes the premenstrual process, the endometrium takes on all of the changes common to the decidua vera at a very early stage, only at this time the changes are of a lesser degree. As soon as free hæmorrhage occurs, the congestion is relieved. The postmenstrual and interval periods constitute a process of repair. Each of these periods possesses definite histological characteristics, the most typical changes being found in the premenstrual and postmenstrual periods.

3. As has been said, the periods blend into each other and are subject to slight variations in different individuals. The menstrual period lasts from four to six days, the postmenstrual three to five days, the interval from ten to twelve days, and the premenstrual about ten days.

4. It is therefore important that the pathologist, when examining endometrium, should know when the last menstrual period occurred.

This knowledge, combined with an understanding of the changes during the various transformations of the normal endometrium, will show that many of the cases diagnosed as glandular or interstitial endometritis are nothing more than different periods of the normal endometrium, and consequently, that endometritis, in the true sense of the term, is much less frequent than is commonly thought.

5. In the classification of endometritis, we would recommend its division into acute and chronic, doing away with the cumbersome and faulty classifications which are now used.

PULSATING EXOPHTHALMOS; LIGATION OF THE INTERNAL CAROTID; RECOVERY[1]

By A. E. HALSTEAD, M. D. and A. J. BENDER, M. D., Chicago, Illinois

Mr. B., single, age 24, and by occupation a farmer, first came under observation on August 27, 1909, when he was admitted to the Illinois Charitable Eye and Ear Infirmary, when the following history was obtained: On January 27, 1909, the wheel of a loaded wagon passed over the patient's head just back of the left eye. He was unconscious for three days following the accident. So far as he can tell the eye bulged much more at that time than it did when he entered the infirmary, the left eye turning sharply towards the nose; the eye appeared paralyzed, the lids were swollen and he could not close the upper lid, move his jaw or tongue or swallow. Roaring noises synchronous with the heart beat could be heard from the time the patient regained consciousness until he entered the hospital. He remained in bed two weeks following the accident and during that time the sight in his left eye was very much impaired.

An examination of the left eye was made on August 27th. The left eye turned in 45°. The eye was very prominent and two-thirds inch farther forward than the right eye. The veins on the outside of the upper lid were very large and tortuous. The blood-vessels of the sclera were also enlarged. The cornea was injected and over an area four millimeters square, in its center, there was a fairly dense cicatrix. The anterior chamber was shallow, the iris not quite perfectly round, but normal in color. Vision at this time was R. E. 20/30–3; L. E. 20/120. On September 28th, the vision was again taken when it was found to be 20/20 in the R. E. and 20/50 in the L. E.

On October 10th the patient entered St. Luke's Hospital and was referred to Dr. Halstead's service. At this time the left eyeball protruded forward and deviated inward; the blood-vessels of the eyelid and eyeball were enlarged and tortuous; a pulsating tumor could be felt over the lid and in the inner angle of the eye; a bruit could he heard over the left temporal region and the patient complained of constant roaring noises, heard most distinctly in the left ear and synchronous with the heart beat.

On October 14th Dr. Halstead ligated the left internal carotid near its origin. An incision was made along the anterior border of the sternocleido-mastoid muscle. The blood-vessels were exposed and the internal carotid artery identified by making traction on a ligature passed around it, and feeling for the pulsation in the orbital tumor which had disappeared. The artery was now doubly ligated with chromicized catgut and the skin closed with silkworm gut.

October 15th, the day following the operation, the exophthalmos was not so marked as it was before the operation, the bruit had disappeared, and a very slight pulsation could be detected only at the inner angle of the left eye, while the head noises and ringing in the ears were absent.

October 16th the patient complained of constant pain in his left eyeball.

October 18th the bruit remained absent, the pulsation at the inner angle was scarcely perceptible, and the exophthalmos had slightly decreased. The patient complained of stiffness of the lower jaw.

Up to the present time there has been no return of the bruit or head noises. The left eye still turns inward, there is some exophthalmos and the patient occasionally complains of pain in the left eye.

The disease known as pulsating exophthalmos is in the majority of cases traumatic in origin, usually unilateral and is characterized by exophthalmos, pulsation, bruit, and ringing noises in the head.

The etiology in about 70 per cent of cases is traumatism, such as a blow on the head, or, in Bernard's case (Annals of Surgery, vol. 39), a gunshot wound.

The remaining 30 per cent are spontaneous in origin, occurring in the course of diseases of the blood-vessel walls, such as in chronic endarteritis.

The symptoms are characteristic, the most

[1] Read before the Chicago Surgical Society, November 5, 1909. See discussion, page 101.

prominent being protrusion of the eyeball, the axis of which, when there is paralysis of the ocular muscle, deviates and its motility is impaired. The eyelids become swollen and œdematous. A pulsating tumor can be felt at the inner angle which is soft and reducible. A bruit can be heard over the pulsating tumor and over the temporal region on the affected side. The blood-vessels of the lids, bulb, and retina become enlarged and tortuous.

The pathological changes which have been found in different post-mortems are: traumatic aneurism of the cranial portion of the internal carotid artery, an arteriovenous communication between the internal carotid artery and the cavernous sinus, aneurism of the ophthalmic artery, and varicosed condition of the superior ophthalmic vein. Revington (Medico-Chirurgical Transactions, 1875, vol. 58, p. 183), in recording twelve post-mortem examinations, found in no case simple traumatic aneurism of the internal carotid artery. In six cases there was an arteriovenous communication between the internal carotid and the cavernous sinus. In eight the superior ophthalmic vein was varicosed, in one an aneurism of the ophthalmic artery, and in one simple dilatation of the internal carotid. These lesions are often associated with diseased conditions of the blood-vessel walls and fracture at the base of the skull. In four out of nineteen post-mortems collected by Sattler (Handbuch der Augen Heilkunde, 1887) an arteriovenous aneurism was found with a tear of the artery in the cavernous sinus.

The treatment consists in lowering the blood pressure in the internal carotid artery, which may be done by ligation of the common or internal carotid or by digital compression. Digital compression is indicated in cases where surgical interference is contraindicated as in disease or old age. Ligation of the common carotid was first performed for the correction of this disease in 1809. Murry (Annals of Surgery, vol. 39) recommends that the internal carotid rather than the common carotid be ligated as there is less tendency to recur.

Boden in 1899 collected all the cases treated (Deutsche Zeitschrift fur Chirurgie, bd. 51) by ligation of one and both common carotids. Of those in which one common carotid was ligated there were fifty-eight cases and of these twenty-six were cured, twenty improved, six unimproved, and six died. Among the five in which both common carotids were ligated, there was only one death; the remaining four being either cured or improved. Murry (Annals of Surgery, vol. 39) mentions two cases, those of Dollinger, and Woodward, in which after both common carotids were ligated, the symptoms returned but subsided after ligation and resection of a portion of the superior ophthalmic veins.

THE SACCULAR THEORY OF HERNIA, WITH REPORT OF A CASE[1]

By ALEX. MacLENNAN, M. B., C. M., Glasgow, Scotland
Surgeon to Out-patients, Western Infirmary; Extra Honorary Surgeon, Royal Hospital for Sick Children, Glasgow

THE report of the following case may be of interest to the supporters of the saccular theory of hernia and it lends itself specially to the views of Russell as enunciated in the Journal for November, 1907. R. L., aet. 13, was brought to the Western Infirmary Out-patient Department in May, 1908, on account of a swelling on the left side of the scrotum which had been present from birth but which had diminished somewhat during the last six years. The swelling was a hydrocele of the tunica vaginalis; at its upper part there was an independent globular mass which was considered to be an encysted hydrocele of the cord.

The cord was thickened to some extent — a feature commonly found accompanying hydrocele in children and representing the remains of the processus vaginalis. Signs of hernia were absent.

The operation took place during May in the out-patient theatre and the boy went home immediately afterwards. It was found that the main mass of the scrotal swelling was a hydrocele of the tunica vaginalis. The part considered to be the encysted hydrocele of the cord was really the dilated and almost completely separated extremity of a peritoneal protrusion — the unobliterated remains of the processus vaginalis. This dilated sac lay mostly behind the tunica vaginalis which thus almost enveloped it. The processus vaginalis with its dilated end and the tunica vaginalis were separated from the testicle and the cord. The mass of tissue was divided immediately above the dilated "encysted" part, that which remained being treated as a hernial sac in Macewen's operation; a radical cure being then performed.

The tissue removed as seen in the picture consisted of most of the tunica vaginalis which was laid open from the front so the specimen appears like part of a plate on which rests a rounded swelling — the dilated end of the unobliterated processus vaginalis; the two sections were intimately fused. The smaller sac differed essentially from the end of the sac of an ordinary hernia which lies in front of the tunica vaginalis and is only loosely attached to it. The communication between the globular extremity and the prolongation from the peritoneum was by a minute opening which was just sufficiently small to prevent anything but the slightest quantity of fluid passing back into the peritoneum on pressure (see figure 2), so that the fact of a congenital hydrocele being present as well as a hydrocele of the tunica vaginalis escaped diagnosis. The progress of the case was uneventful; healing being by first intention.

Had this congenital sac been possessed of contents it would have been the typical and rare form of hernia known as infantile. The condition of the parts here will be readily admitted to be of congenital origin and they show conclusively also that an infantile hernia may be of congenital origin. There was no possibility of this being an acquired sac which had been forced down behind the tunica vaginalis. It may be said that till the child became seven years of age the congenital sac contained intra-abdominal contents; this may be admitted, in which case instead of a congenital hydrocele we must read congenital hernia.

The saccular theory of hernia finds support from numerous other facts. Besides the frequency with which, at post-mortem examinations (1), unoccupied peritoneal pouches are found, and the frequency of hernia in children, especially infants, before the advent of strain could come into play, may be instanced the fact that oblique inguinal herniæ in females are always congenital, because in them the broad ligament enters into the formation of the sac and this would not likely be the case were the sac acquired.

Again tubercular peritonitis with excess of fluid in the peritoneum often indicates its

[1] Read before a meeting of the Glasgow Medico-Chirurgical Society, December, 1908. Patient was shown.

Fig. 1.

presence without other symptoms by causing a hydrocele to become apparent. No one would aver that the very slight increase of intra-abdominal pressure due to a little ascites would be the means of producing a hernial sac so it must be admitted that the sac was pre-existent — was congenital. Even marked ascites does not do such a thing unless we accept the protrusion of the umbilicus as an instance of this nature. Further occasionally an intra-abdominal tumor grows down the inguinal canal yet no one would credit a tumor with the power to force a hernial protrusion. Thus in the dead we find the possibility of intra-abdominal contents entering pre-formed sacs and in the living intra-abdominal contents taking advantage of such congenital sacs. In certain developing herniæ we see the contents running down obviously narrow and slender sacs whereas we would expect if the protrusion were the cause of the sac formation (as for instance in ventral hernia after laparotomy) it would not be a slender process but would have a blunt and bulky form just as we get in herniæ starting from a funnel-shaped protrusion. In many operations on hydrocele in infants if we look we find remains of the processus vaginalis and it is an easy inference to say that there will be in such cases a funnel-shaped process of peritoneum entering the internal ring and awaiting some increase in intra-abdominal tension to develop into a hernia of the ordinary acquired type. During operation on hernia in infants it becomes increasingly clear that there is no other difference between congenital hernia or hernia in a sac separate from the tunica vaginalis except the fact of that separation. During operation on many bubonoceles we find a slender unoccupied part of the sac entering the scrotum and again only awaiting the descent of the more bulky contents. Bevan (2) has recently referred to cases where hernia after radical cure has recurred very quickly as being due to the presence of two sacs, or one sac with two sleeves. He has recently discovered such a condition during operation. Finally the success of the operation for the cure of hernia in children which effectively obliterates the sac goes a long way to prove that the essential factor in the production of a hernia is the presence of a pre-existent sac. The saccular theory has therefore an important bearing upon treatment and supports the view that hernia in infants ought to be operated upon and that the operation should principally deal with the sac. The view that many of these herniæ in children cure themselves spontaneously finds its retort in the fact that congenital pouches are so commonly found post-mortem and so commonly become distended by ascitic fluid. It is, of course, one thing to prove that some herniæ form because of the pre-existence of pouches and another to prove that all herniæ form because of such pouches, still the frequency of finding sacs awaiting contents in adults as well as in children is very convincing when taken along with other evidence in favor of it, of the correctness of the saccular theory.

Another point of interest in the case was the fact that recovery was uninterrupted although the boy was treated as an out-patient. All children who can be carried home and can receive a reasonable amount of attention are suitable for a radical cure in an out-patient department. The danger of operating upon hernia is perhaps twofold. To prevent sepsis

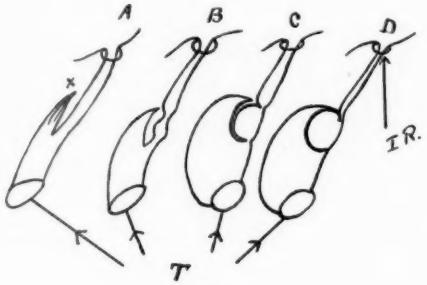

Fig. 2.

following operation, means may be as effectively taken in the out-patient as in the ward theatre. Subsequent soiling of the wound can be prevented by an efficient dressing. That recommended consists in covering the minute wound (in an infant from one-half to one inch suffices) with a small pad of gauze and sealing it in completely with rubber adhesive plaster which may remain on for a week. This protects the wound from the action or effects of urine and from other outside contaminations. It is comfortable, so there is little tendency for the child to interfere with the dressing. The other danger and the one specially feared in the out-patient treatment of hernia is the bursting up of the stitches. The fixation accorded by a dressing covered in by adhesive plaster will amply protect the external stitches against all interference from mere movement. With regard to the internal stitches movement during transit home could possibly be the means of their giving way. Yet the stress from rough movements while the child is being transported home is negligible when compared with that present during retching or even coughing. To avoid strain during urination all infants should be circumcised previous to operation for hernia. It is often noticed that a chronic cough is the exciting cause of hernia in a patient who had formerly been accustomed to strenuous labor. Further, if during examination for a possible hernia pressure be made upon the abdomen the protrusion fails to make its appearance till the child either cries or strains otherwise. Thus it is evident that the forces acting from within are much more effective in forcing a hernia into a sac or forming a sac *de novo* than are those applied from without. These forces are active alike in children in bed at home or in a ward. The requisite attention therefore implies retention of the little patient in bed while at home. As a matter of fact it is the obliteration of the sac and not the retention of the deep sutures on which depends the success of the radical cure. From experience, the home treatment of children operated upon for hernia in the out-patient theatre is found to interfere in no way with the success of the operation.

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NOMA

With the Report of a Case that Recovered without Perforation

By MILES F. PORTER, A. M., M. D., Fort Wayne, Indiana
Surgeon to Hope Hospital, Professor of Surgery in the Indiana University School of Medicine

NOMA is a rare disease. Out of 13,000 cases admitted to the London Hospital for Sick Children there were only six cases of noma.

It is essentially a disease of young childhood, but has been observed in persons of all ages up to 70. It is more often seen in adults in India than in any other country. Nursing babies seem to be in great degree immune. Noma does not confine its ravages to the human race, but attacks the lower animals also.[1] Noma usually occurs in the mouth, but not infrequently attacks other parts, especially the vulva, the rectum, and the external auditory canal. Holt[2] saw five cases beginning in the auditory canal, apparently due to the use of the same syringe to clean the ears without disinfection. It is more frequent in girls than boys. Noma is especially apt to attack persons debilitated by previous or existing disease. Of the predisposing diseases, measles is by far the most important. Osler says that half the cases occur during the convalescence from measles. Noma has been known to occur,

[1] White and Blackwood, University of Pennsylvania Medical Bulletin, December, 1908.

[2] Crandon, Place, and Brown, Boston Medical and Surgical Journal, April 16, 1909.

however, in strong children and in healthy adults. While bad hygienic conditions seem to predispose to noma yet it has been known to occur in patients with the best hygienic surroundings. This is true of the case reported in this article.

That trying climates predispose to this disease seems proven, especially cold, damp climates.

There is good reason for believing that the indiscreet use of mercury predisposes to the development of noma. It is quite certain that diseased teeth, and especially gingivitis are important etiologic factors.

My patient had a severe pyorrhœa when she came to me and had had it some time before the development of the noma. The experience of Holt above mentioned, of Lund, of Siebert, and especially that of Blumer and MacFarland in the Albany Orphan Asylum leave no doubt in my mind of the contagiousness of noma. It is equally certain, on the other hand, that it is only slightly contagious.

While we are not in a position to say just what germ or germs produce noma, I think we are warranted in saying that it is a germ disease, but that the germ or germs producing it require a peculiarly prepared soil, hence the conclusion that it is contagious, but only slightly so.

As above stated the bacteriology of noma is as yet not fully understood. The weight of evidence seems to be in favor of the theory that noma is "due to the combined action of bacteria from the mouth acting upon specially vulnerable tissues."[3] Buday regards the symbiosis of a spirillum and fusiform bacillus of especial etiologic importance. The investigations of Perthes make it highly probable that the essential etiologic factor is an anærobic organism. The majority of investigators regard noma, ulcerative and gangrenous stomatitis, gingivitis, and Vincent's angina as identical processes differing only in degree. Some there are, however, notably Kissel,[4] who dissent from this view.

The investigations and experiments of Petruschky and Freymuth, and Passini and Leiner seem to prove that in some cases of noma diphtheria bacilli play an important etiologic role.

In the case herein reported the patient suffered from diphtheria two years before the attack of noma, and at that time had a gangrenous ulcer of the tongue, the resulting scar from which was plainly visible when the patient was brought to me.

The pathologic and microscopic anatomy of noma have been well worked out, the symptomatology thoroughly studied, and the physical signs carefully observed and noted, hence the diagnosis is easy.

Pneumonia is by far the most common complication, occurring in 58 out of 63 cases collected by Tourdes, and in 19 out of 21 cases examined by Barthez and Rilliet, and is the immediate cause of death in practically all fatal cases. Coincident gangrene in other parts of the body is not infrequent. Severe and even fatal hæmorrhage has been observed, but this is a rare complication. All observers agree that noma is usually fatal and that in the majority of cases which recover the deformity is frightful. Recovery is slow when it does occur. Toothlessness and defective speech are common results in cases that recover. Relapses sometimes occur after convalescence seems well established. Extreme youth, old age, bad hygienic surroundings, extensive involvement of the tissues, and bad general health influence the prognosis unfavorably. This is true of complications also, especially pneumonia. Other things being equal, the longer the patient survives the more likelihood of ultimate recovery. Noma of the auditory canal and genitalia seem to be especially fatal. Whether we agree with Crandon, Place, and Brown, in their opinion that noma is not contagious, or with Weaver and Tunnicliff who hold the contrary view, it is certainly wise to isolate all cases. In view of the frightful mortality every precaution should be taken to prevent the occurrence of the disease.

The mouths of delicate children should be carefully looked after and kept clean. Especial attention should be given to the mouths, ears, and genitalia of sick children, especially those suffering from measles, diphtheria, typhoid fever, or any form of stomatitis, or gingivitis.

[3] Weaver and Tunnicliff, Journal of Infectious Diseases, January 1, 1907.

[4] Journal A. M. A. (ab.) vol. xlv., p. 1994.

Of scarcely less importance than the local measures in preventing the disease are those looking toward the general condition of the child, such as good food, proper clothing, and pure air — in a word, good hygienic conditions. My own experience in the treatment of noma is limited to two cases. The one herewith reported and one other seen with the late Dr. A. E. Vanbuskirk. In both recovery ensued, and in neither was either the knife or cautery used. This experience is, of course, entirely too small to base conclusions upon, but this experience together with a careful study of the literature of the subject compels me to dissent from the view so generally expressed that excision or the use of the cautery or both is the best means of arresting the disease. The general condition of the patient seems to play almost, if not quite, as important an etiologic role as do micro-organisms. This opinion is given additional support by the fact that relapses not infrequently occur and that plastic operations for the relief of deformity due to noma are apt to lead to extensive sloughing if undertaken too early. It would seem therefore, that the knife and cautery should be used only in the cases seen early, before much destruction of tissues has occurred and in those cases in which the general condition of the patient is fairly good. In the case herein reported anything like what is generally described as an adequate use of the knife and cautery would have resulted in the loss of a large part of the cheek, whereas under the treatment used no perforation occurred and hence there is no deformity. In the other case seen by me there was a moderate destruction of the lower lip which could easily have been restored. The seeming importance of the B. fusiformis in the production of noma and the fact that this bacillus is anærobic would suggest the use of peroxide of hydrogen in the prophylactic as well as the curative treatment of the disease. This was borne out in the experience of Crandon, Place, and Brown, and in my own. Permit me to recall here the fact that most of these patients die from pneumonia.

The writer would therefore urge the employment of the open air treatment, together with forced feeding and the frequent local use of peroxide of hydrogen, reserving the use of the knife and cautery for the cases wherein the disease may be eradicated without too great a sacrifice of tissue and wherein the clinical features seem to point to the micro-organisms as the chief etiologic factors rather than the generally impoverished condition of the patient.

When the bacteriology of the disease is known we may expect good effects from the vaccine treatment. In my own case this was employed, but without striking results, and inasmuch as there was a slight relapse, after the patient went to her home, from which she recovered without the vaccines, I do not feel warranted in giving them much credit for the result in this case. In conclusion I would especially refer those interested in this subject to the excellent papers of Weaver and Tunnicliff, and Crandon, Place, and Brown, both of which have been already referred to in this paper.

AUTHOR'S CASE

The following case was referred to me by Dr. Reid of Van Wert, Ohio, and was seen by me first on May 30, 1909, at the Hope Hospital:

H. E., female, 15 years, school girl. Family history negative. She has had all children's diseases, and has been sick most of the time since she was eight years old. Two years ago she had diphtheria, and has not been well since. During the attack of diphtheria she had a gangrenous ulcer of the tongue the scar resulting from which is plainly visible now. During this illness there was a slight menstrual discharge, the first and only one she has had. Some pyorrhœa had existed for some weeks before present trouble came on. Two weeks prior to her entrance to the hospital her face on the right side began to swell and she noticed a "canker" on the inside of the cheek. Cheek was quite sore and painful and teeth were quite loose. She complained of some difficulty in swallowing. She had been losing weight for a month.

Examination shows a large, immature girl, rather poorly nourished, skin and mucous membranes pale. Cheek is much swollen and glossy, partially closing eye of same side. Over the most prominent part of the swelling there is a cyanotic area. The whole cheek is tender and hard. On the inside of the cheek extending from the ramus of the jaw to within a half inch of the corner of the mouth, is an ulcer covered with a grayish-yellow slough. All the teeth are loose, gums are sore, pus escapes on pressure from around the roots of the teeth, salivation marked, breath extremely fetid. Temperature 99½ degrees F., pulse 116 per minute, regular, but with little volume or force.

Patient is not confined to bed, but tires easily and lies down most of the time. Appetite is fair. The urine was found to be normal. The blood examination showed 26,880 white cells, 56 per cent polynuclears, large lymphocytes 9 per cent, small lymphocytes 31.5 per cent, transitionals 2.5 per cent, eosinophiles 1 per cent.

Dr. Rhamy's report on the bacteriologic findings is as follows: "Smears from this case show many short and long bacilli, pointed at the ends and thicker in the middle, which decolorize by the Gram method. There are also present a few streptococci and leptothrix and a moderate number of spirochæte resembling the spirochæte dentium. Cultures showed a luxuriant growth of an ærobic bacillus, decolorizing by Gram, and a few streptococci. This bacillus is evidently that described under the name of bacillus fusiformis and occurs in ulcerative lesions of the mouth." The patient was kept in bed with the windows wide open and during the day she was kept on the porch. She was given a liberal diet and in addition to the regular meals she was given a glass of milk with an egg and two drams of rum three times daily. She was also given the juice of three lemons daily. Every three hours the mouth was washed with peroxide of hydrogen with the aid of a dropper to insure a thorough washing of the nomatous area. After four days of this treatment there seemed to be some general improvement, the nomatous area had not spread and the cyanosis of the cheek was less marked. I now concluded that we had better substitute a bichloride solution 1-5000 for the peroxide because of its superior germicidal power. The other treatment was continued. After one day's use of bichloride the pain was greater and the cheek seemed more swollen. The treatment was not changed however, until three days later, when, after a talk in Atlantic City where I had gone to attend the meeting of the A. M. A., with Dr. W. A. Pusey of Chicago, who said he thought the weight of evidence was in favor of the trouble being due to an anærobic micro-organism, and recalling the apparent change for the worse when the bichloride was substituted for the peroxide, I telegraphed Dr. Weaver, my assistant, to stop the use of the bichloride and resume the use of the peroxide. After this the treatment was not changed except that four injections of bacillus fusiformis were given, one of 50 m. on June 8th, 33⅓ m. on June 12th, 25 m. on June 16th, and 25 m. on June 21st. On the sixth day of her stay at the hospital a diarrhœa developed which was checked by a few doses of opium and bismuth. The ulcer extended until it reached the corner of the mouth, but in no other direction was there any extension of the nomatous process after she entered the hospital. Shreds of necrosed tissue were washed away or gently removed by the forceps daily. On my return from Atlantic City I found the patient much improved both as to her general health and the local condition save that the ulcer extended to the corner of the mouth. Perforation did not occur. On June 27th (29 days after she entered the hospital, and 42 days after the onset of the disease) she was discharged with the ulcer entirely clean of necrosed tissue and rapidly healing. A few days after her return home there was a slight relapse evidenced by pain, swelling, and a dirty appearance of the ulcer, but this soon disappeared and about two weeks later when I saw her the ulcer was nearly healed. She was feeling well, but was still rather easily tired and was decidedly anæmic. The pyorrhœa was not any better. A slight elevation of temperature most marked in the evening was nearly constant until convalescence was established. On five occasions it was normal in the morning and on one, one-half degrees below normal. The highest temperature recorded was 101⅘ degrees F. on the 33d day of the illness. The pulse was feeble and ranged from 100 to 116 per minute save on five occasions when it was recorded at from 84 to 98 per minute. There were no changes in the clinical aspects of the case as a result of the injections of the bacilli. No examinations were made to determine the effect, if any, of the injections of the bacilli upon the blood.

Dr. Reid, the patient's physician, under date of October 1, 1909, writes of the case as follows:

"She came home weighing 81 pounds — she now weighs 102 pounds. She is feeling pretty good and I allow her to attend school half a day — I thought best to not let her go all day.

"The sore is not entirely healed, however, it is much smaller and the adhesions that formed have broken up so the cheek is fairly freely movable. She cannot open the mouth very well, but much better than she did. The gums still recede from the teeth and the teeth are loose. The breath no longer has the foul odor. The cheek is swollen some but not enough to attract attention. The red spot on the cheek has disappeared and her color is tolerably good. She has a good appetite. I anticipate complete recovery so far as the noma is concerned.

"The cheek has softened and become more pliable. The cicatrix is less noticeable since the adhesions that formed seemed to give way."

THE BIER TREATMENT IN TUBERCULOUS JOINT DISEASE[1]

By LEONARD W. ELY, M. D.
Surgeon to the Sea Breeze Hospital; Consulting Orthopedist to the Roosevelt Hospital, etc., New York City

SEVENTEEN years have elapsed since Bier announced in a few words to the Deutsche Gesellschaft für Chirurgie his results in the treatment of about twenty cases of joint tuberculosis by "Stauungshyperæmie."[2] Following this by numerous articles and at length by a book, Bier has again and again called attention to the treatment that bears his name, amplifying and extending his ideas as time went on. He has been joined by many others, and has been opposed by some, until the writings on the subject have attained great proportions, and his disciples have recommended the various forms of hyperæmia for almost every disease to which the human family is heir. Schools of medicine have been founded on less.

As with all other panaceas, so probably will it be with this. Extravagant praise will be succeeded by extravagant denunciation. If we can maintain an attitude of scientific scepticism, we may avoid either extreme, and may pick out and hold fast whatever good the treatment contains.

In this connection let me call your attention to a system of treatment brought forward by Jounod[3] in 1834, called Hæmospasie, which cured croup, tonsillitis, quinsy, cataract, paralysis, insanity, amenorrhæa, cholera, blindness, fractures, wry neck, anthrax, etc. The French Academy awarded Jounod, in 1870, the Grand Prize for Medicine and Surgery. "Supported," as he says, "by their suffrages," he read six papers to them on the various uses of his invention in anæmia, inflammation of the lungs, typhoid fever, gunshot wounds, and epidemic cholera. The treatment was recommended in 1870 to all the hospitals in France by the Minister of the Interior, and received medals at exhibitions in London, Paris, and New York. It consisted of drawing the blood by vacuum glasses (from some of which Bier's are copied) usually away from the diseased parts — derivation. It made the operator "master of the circulation." "The things done are like a miracle. They throw into profound astonishment the spectators and the sick ones." Yet how many of us have ever heard of hæmospasie?

In the first place, we must criticise the soundness of Bier's fundamental argument. He conceived his theory from the fact, first brought forward by Rokitomsky, that patients with heart lesions which cause pulmonary hyperæmia are practically immune to pulmonary tuberculosis. Post hoc ergo propter hoc. It is as rational to consider that persons with the "rheumatic diathesis" are as a rule not subject to tuberculosis, and vice versa; but even so, it is but a general rule. We have now under treatment at the Sea Breeze Hospital, a boy with a poorly compensated mitral lesion, who has gone through the regular four year course of treatment for Pott's disease, and yet his hands and feet are usually bluish red with venous congestion. Again, Bier condemns the use of so-called active hyperæmia in tuberculous joint lesions; but the pulmonary hyperæmia in mitral lesions is essentially an arterial one. On the other hand, a form of treatment may be good although the theory on which it is based is quite erroneous, and we will turn our attention from theory and attempt to get down to the facts.

Three forms of hyperæmia are recognized: 1st. Arterial or active hyperæmia, usually produced by hot air. 2d. Venous hyperæmia — "Stauungshyperæmie"— produced by the elastic ligature. 3d. Mixed hyperæmia, produced by cupping. Inasmuch as Bier condemns the use of the first in surgical tuberculosis, it ceases to be the Bier treatment as far as our subject is concerned, and we shall leave it out of consideration.

[2] Verhandlungen d. Deutschen Gesellschaft für Chirurgie, 1892, i, S. 91.

[3] Bonnard, De l'Hémospasie. Paris, 1840.
Jounod, Traité de l'Hémospasie. Paris, 1875.
Jounod, A Theoretical and Practical Treatise on Hæmospasia. Translated by Mrs. E. Howley Palmer, London, 1879.

[1] Read at a meeting of the Orthopedic Section of the New York Academy of Medicine, October 15, 1909.

The treatment by the elastic bandage was Bier's original method. At first he applied the bandage for a short time daily, with the layers one over the other, and bandaged the parts distal to the diseased area. Later he advocated the application of the bandage during practically the entire twenty-four hours; but on account of various untoward results, he abandoned this scheme and again advocates a shorter period, — from one to three hours daily. He uses an ordinary Esmarch bandage, about six centimeters wide, spreading the layers out so as not to exert undue pressure, and covering the skin, if it be sensitive, with gauze or muslin. The part of the limb distal to the lesion is not bandaged. All cases of joint tuberculosis, "open" or "closed," receive this treatment. If sinuses are present, he recommends cupping in addition. When abscesses form, he slits them open, applies cups, and continues the elastic bandage, regarding the abscess, not as a contraindication, but as an incident in the process of healing, as nature's effort, so to speak, to cast off the disease. He treats conservatively tuberculous joint disease in patients of all ages, and makes as his contraindications only amyloid degeneration, severe pulmonary tuberculosis, very large abscesses, and bad position of the limb. He has given up the use of iodoform except in the case of large abscesses filling up a joint. Here *Stauung* is not indicated. He uses no fixation nor extension apparatus, except in disease of the knee or foot. On these joints he applies plaster or a brace, which is worn only when the patient goes about. Knees he usually resects, for as a rule hyperæmia in disease of the knee is unsuccessful. The treatment must be continued for at least nine months and two cardinal rules must always be observed, viz., the hyperæmia must be warm, and it must be painless. Motion is permitted and even encouraged.

Mixed hyperæmia by cupping. This form of the treatment owes its elaboration largely to Bier's assistant, Klapp. The sterile glass cups, made in various shapes to fit the different regions of the body, and provided with rubber bulbs to exhaust the air, are applied over the mouths of the sinuses, and are left in position for about five minutes, then removed for three minutes, and then reapplied in a slightly different place to avoid pressure irritation. This is continued for three-quarters of an hour, at first daily, then every two or three days. Because of the tendency to the formation of tuberculous ulcers of the skin, the area to be cupped should be washed with benzine and then covered with equal parts of lanolin and vaselin before the cups are applied and afterward. Hofmann[1] found by microscopical examination of the granulations in the wall of the fistulæ, that cupping effected a widening of the walls of the vessels, and a washing out of leucocytes from the tissues, and Félegházi,[2] that great numbers of bacteria were drained out; and doubtless the good results of cupping, as others have pointed out, are due, not alone to hyperemia, but largely to the mechanical drainage which the suction compels. Klapp maintains that if abscesses are properly "hyperæmized" after opening, they will not become infected; but he considers it a crime to open them if hyperæmia be not subsequently regularly and persistently induced. In order to induce hyperæmia in a limb by suction, various glass chambers have been devised — "Saugapparate" — provided with a rubber tube and a suction pump, and having at their open end a loose soft rubber cuff. Through this cuff the limb is passed, and then made fast by an Esmarch bandage. The resulting hyperæmia is not only one by suction, but also one by constriction of the rubber bandage. This is the form most used to promote motion in an ankylosed joint, and good results are claimed for it in spina ventosa. In treating this latter the entire hand or foot is inserted into the apparatus. In using these suction apparatuses, the operator pumps out the air, and leaves the limb thus for a few minutes; then opens the valve and releases the pressure for twenty seconds to three minutes; and continues the treatment for from twenty minutes to a half hour, at first daily, later every two or three days.

Marked difference of opinion exists as to the rationale of the treatment. Bier considered inflammation as a benign process and regarded his treatment as an imitation of nature. The

[1] Münch. med. Woch., 1905, No. 30, 1864.
[2] Deut. Zeitsch. für Chir., xciii, 459.

carbonic acid in the venous blood kills the tubercle bacilli, according to his view. Hamburger thinks the increased alkalinity of the blood is responsible. Heller ascribes the results to a sort of tuberculin action through the retention of the products of tissue change in the blood. Büchner and v. Félegházi think that the accumulation of leucocytes is the essential feature; while Makara, Rosenberger, and others say that the treatment cures by the formation of connective tissue. In Nothnagel's Pathology[1] one learns that the results are due to the tuberculin action of the dammed back lymph, rather than to anything in the blood itself.

Many articles on Bier's treatment in bone and joint tuberculosis have appeared in the medical journals during the past few years, most of them by German writers, a large number by Americans and Englishmen, fewer by Frenchmen, and very few by Italians. As can be seen by the abstracts accompanying this article, the majority of the authors praise the treatment highly, some have found it of little use, and some, notably Koenig, condemn it. All agree that it has its dangers. It is claimed that the pain is soon relieved, and that the joints recover in a shorter time than under the old methods of treatment, and often with a good range of motion. Some find that it is more efficacious in closed tuberculosis than in open; but most find to the contrary. There is a practical unanimity on its relatively poor action in knee joint disease. Some use Bier's treatment combined with iodoform injections.

There are several considerations here that we must remember: 1st. Most cases of joint tuberculosis with or without conservative or radical treatment recover. 2d. There is always the liability to a mistake in diagnosis. A recent laboratory examination of about forty joints removed by various surgeons for tuberculosis, shows that in about one-third of the cases the diagnosis was erroneous, as has been pointed out in a recent paper; *and these were cases in which the operator has had a chance to correct his original diagnosis by examination at the time of operation.* A certain diagnosis is a very difficult matter. Even the examination under the microscope of tissue removed for diagnosis may be misleading, for tuberculosis can exist in one part of a joint and be absent in another. The tuberculin tests also are not final. The clinical diagnosis in a closed case of joint disease may furnish a good working basis for treatment, but when unsupported by positive microscopical findings or by the inoculation of a guinea-pig, it is quite inconclusive. 3d. In experimenting with a new form of treatment, one is much more liable to publish his results if they are affirmative than if they are negative or unfavorable. 4th. The joints that recover with good motion under the Bier treatment are notoriously those in which the same result is apt to follow other forms of treatment.

In considering, then, the use of the Bier treatment in joint tuberculosis, we see that it finds its greatest use in the upper extremity and in the ankle and tarsus. It is of less service in knee joint disease, and can not be applied in disease of the hip or of the spine.

My own experience with the treatment, while more or less limited,[2] and acquired almost entirely during the past year, has been favorable and warrants a continuance of the experiment. I have tried it in only two cases of closed tuberculosis for any length of time; in one of which, a knee, the rapid occurrence of a large abscess led me to discontinue it, contrary to Bier's advice. Several other patients on whom I started to apply the hyperæmia at the dispensary, soon ceased to attend. They have given me the impression that in early cases the treatment is not practicable for dispensary patients. They seem to want to see something done. In the cases with small sinuses, our results have been, as a rule, excellent, though, as the treatment has often been combined with other measures, it is hard to assign to it its exact proportion of credit. The treatment of uninfected abscesses by slitting and cupping we have not tried. It seems inferior to aspiration and injection. Since adopting Calot's method of treating cold abscesses only one or two have become infected at the Sea Breeze Hospital, and we have used it many times.

In the treatment of long, infected sinuses,

[1] Nothnagel. 1900, Wien, Alfred Hölder.

[2] I have full notes on eight cases only, 3 of disease of the calcaneum, 2 knees, 2 elbow, and 1 elbow and wrist. On other cases I have used it for a short time.

cupping must be compared with the injection of bismuth paste, with which also we have had excellent results.

In fact, the whole treatment must be compared with all the other methods of treatment of tuberculous joint disease which we possess, and by this comparison it must in the end stand or fall. It is still on trial. The eminence of its originator and of its advocates will insure for it a fair hearing; but even this will not save it from going the way of many predecessors if it be found wanting.

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KLAPP. Zeitschrift f. ärztliche Fortbildung, 1906, ix, 281. Die Behandlung lokaler Entzündungen durch Stauungshyperämie (mittels Stauungsbinde und Saugglas).

The use of the bandage is recommended for one to three hours daily. After instruction, the patient or his relatives may apply the treatment at home, returning every two weeks for supervision. No cold abscess should ever be opened unless hyperæmia be subsequently used. The cups are used when sinuses are present, applied for five minutes, and then removed for three minutes, for three-quarters of an hour daily. At first this is done every day; later every two or three days. The granulations soon take on a firm, bright red, healthy look, and the tissues themselves become firm and hard. He obtains excellent results in spina ventosa by inserting the whole hand in the vacuum glass once or twice a week.

KÖNIG. Tuberculose der menschlichen Gelenke. Hirschwald, Berlin, 1906.

S. 51. Wir haben bei unseren Versuchen mit Bier 'scher Stauung nichts von Heilung gesehen, was wir nicht bei unserer gewöhnlichen Behandlung in derselben Zeit auch beobachtet hatten. Dagegen haben wir unter Stauung die Entwicklung von Abscessen beobachtet und haben wiederholt Gelenke mit grossen Abscessen resecirt, welche anderwärts mit Stauung behandelt waren. Unsere Mittheilungen über die grössere Gefahr eitriger Tuberculosis sind nicht geeignet, solcher Behandlung das Wort zu reden.

K. VOGEL. Ueber Gelenktuberculose. Deut. Zeit. f. Chir., 1908, xcvii, p. 109.

Seventy-nine cases: 37 knees, 19 feet, 11 elbows, 12 hands. Of these all the elbows and feet which continued the treatment and could be followed up recovered. One patient with tuberculosis of the hand died of pulmonary tuberculosis. While the author was using Bier's treatment he excised or amputated only two elbows, two feet, and no hands. He emphasizes the necessity, when cups are used, of removing them every few minutes and shifting them slightly. They must be adjusted carefully so that their sucking action is neither too strong nor too light. Neither probing nor curetting must be done. The treatment is not to be entrusted to a nurse. It must be individualized.

Says that the joints with the richest blood supply give the best results.

CARL DEUTSCHLÄNDER. Münch. med. Woch., 1907, p. 721.

"Die Hyperæmie is ein Sammelbegriff für mechanische, physicalische, chemische und biologische Vorgänge der verschiedensten Art, deren Ursachen noc zum grössten Teil im Dunkeln liegen."

The writer praises the treatment highly and recounts a number of cases in which it has been successfully used. Only one joint in his forty-four cases came to a resection, a knee. One finger was disarticulated so as to make the treatment simpler! Two diaphyses of spinæ ventosæ were resected.

He emphasizes the importance of long continued treatment and lays down certain rules:

1. The hyperæmia must always be of short duration (one to two hours daily). 2. It must not be painful. 3. The treatment must be intermittent, that is, after several weeks it must be omitted for about a week. 4. The hyperæmia must be supplemented by Klapp's cupping method when fistulæ are present. 5. Treatment must be begun early and continued long after the symptoms have disappeared. 6. Infected abscesses must be slit up. 7. Cold abscesses must be punctured and then cupped by Klapp's method. 8. Immobilization is not necessary nor advisable. Light movements are advised. 9. The joint must be protected. — "Entlastung."

The author considers the Bier treatment the best conservative treatment in our possession.

BUM. Die Behandlung von Gelenkerkrankungen mittelst Stauung. Wiener med. Pr., 1905, Nos. 3 and 4.

Bum observes that joints distal to the joint being treated by hyperæmia are not subject to the usual stiffness.

HOFMANN. Veranderungen im Granulationsgewebe fistulöser fungöser Herde durch Hyperæmisierung mittelst Saugapparate. Münch. med. Woch., 1905, No. 39, p. 1864.

By microscopical examination of granulations from the walls of tuberculous joint fistulæ before and after cupping, Hofmann arrived at the conclusion that the treatment effected its results by a widening of the blood vessels and a washing of the tissues free of leucocytes.

HENLE. Beiträge zur klinischen Chirurgie, 1898, xx, 3, p. 803.

Henle gives the results of the conservative treatment of joint tuberculosis at the Breslau Klinik, and finds them much better than those with radical treatment. His percentage of recovery with "Stauung," however, is much below that with the injection of iodoform-glycerin (66.7 per cent and 82.5 per cent).

GEBELE UND EBERMAYER. Ueber Behandlung der Gelenktuberculose. Münch. med. Woch., 1906, No. 13.

The writers maintain that only those cases lend themselves to the Bier treatment, which become rapidly blue-red and painless. Cases with fistulæ are more suitable than those without them. They apply the bandage four to six hours daily and combine the treatment with fixation.

KLAPP. Mobilisierung versteifter und Streckung Contraktuierter Gelenke durch Saugapparate. Münch. med. Woch., 1905, No. 17.

A discussion of the principles of some of the apparatus for treating contracted joints by the air pump and rarefied air.

KLAPP. Die Behandlung der chirurgischen Tuberculose mit dem Schröpfverfahren. Arch. f. klin. Chir., 1906, lxxx, 42.

The pauses customary in the application of cups to acute infections are not so important here. Cold abscesses are to be slit up asept cally and then cupped. Considers it a crime to open a cold abscess unless it be "hyperæmized;" if it be, then it never becomes infected. He never scrapes tuberculous granulations, and always

leaves the cups on for some time after the pus has ceased to run. This drains the tissues and helps to prevent infection. When the serum discharge that follows the purulent is examined, it is found to contain leucocytes, lymphoctyes, red blood corpuscles and bacteria, while the blood-vessels in the granulations are widened and free from leucocytes. From experiments on guinea-pigs the infectiousness of the abscess that has been cupped has been found to be very slight. The tuberculous skin ulcers found in the neighborhood of fistulæ can be prevented by cleaning the skin with benzine and then by covering it with salve before the cups are applied. Recently he has used his large cups (Sauggläser) with good effect, combining this with puncturing.

V. SCHMIEDEN. The treatment of Surgical Tuberculosis by Hyperæmia (Bier). Medical Record, lxxii, No. 7.

Says the joint must not be left in fixation, but recommends rest in bed for severe tuberculosis of the leg, protecting the joint by mechanical apparatus. The joint must be movable after the disease has healed. He excepts from this the knee on account of its "complicated construction." Milder cases are to be treated by splints and by hyperæmia. The hip is not practicable to treat. Recommends opening cold abscesses and cupping them. Uses cups generally on sinuses.

E. v. FÉLEGHÁZI. Beiträge zur Erklärungs weise der Bierschen Stauung im Granulationsgewebe fistulöser fungöser Herde. Deut. Zeit. f. Chirurgie, xciii, p. 459.

From a series of microscopical examinations Félegházi finds that the beneficial results of Bier's treatment are not due to any bactericidal elements in the blood but to the abundant production of connective tissue. The good results of the Klapp cups upon the fistulæ are due to the sucking out of great numbers of bacteria.

W. KÜHNE. Die Anwendung der Bier-Klappschen Saugapparatezu orthopædischen Zwecken. Monatschr. f. Unfallheilkunde, xiv, p. 104.

Author uses the suction apparatus with great effect in limbering up stiff joints. He has improved in comparatively short time joints that have long been stiff.

KRAUSE. Deut. Chir., Lief 28 a, p. 221.

A combination of Bier's treatment and iodoform injections is recommended.

HABS. Münch. med. Woch., 1903, No. 22, p. 938.

In an unusually scientific and valuable article the author gives his experience in about 200 cases of local tuberculosis. On the whole, he regards the treatment as useful. He obtained excellent results in many cases, especially in cases of "closed" tuberculosis, that is, cases without sinuses; but on the other hand many cases needed final operation. He suggests a trial of the method in all cases, but warns against losing time by persisting in it if it does not better the disease. He does not forget that he has also had very good results from other conservative methods, and dwells upon the importance of constitutional treatment.

CHAPUT. Treatment of white swellings and tuberculous synovitis by Bier's method. Revue de Chirurgie, xxxix, 1909, p. 1229.

Chaput reports fourteen observations on tuberculous osteoarthritis and synovitis, in which Bier's method yielded excellent results. These cases include ten cases of tuberculosis of the wrist and tendon sheaths, two cases of tuberculosis of the elbow, and two cases of tuberculosis of the ankle. The majority of these patients suffered from severe forms of white swelling, some associated with fistulæ, or running a rapid course, apparently headed shortly for amputation. All these cases were promptly cured by Bier's method employed alone, without immobilization and without intra-articular injections.

Discussion. Pierre Delbet employed Bier's method a number of times, and his results were negative. He asks whether the excellent reported results actually concerned cases of tuberculosis. There is too much tendency to consider every chronic arthritis as of tuberculous character.

Aaron has utilized Bier's method for three years past, and has not reached a definite conclusion concerning it. But it seems to him that the results have been zero in closed tuberculosis; in tuberculosis with the formation of fistulæ, on the contrary, there are certainly noteworthy improvements, disappearance of pain, and of fever.

Routier applied Bier's method in two cases: one of these, a tuberculous arthritis of the knee, terminated disastrously, and amputation had to be performed; in the other, a tuberculous arthritis of the elbow, the result was zero.

DUPONT, ROBERT. Quelques résultats de la méthode de Bier. Revue de Chirurgie, xxxix, 1909.

The author reports his observations on a number of patients treated with Bier's method, according to the technique employed in Bonn, and learned from Bier in person on the occasion of two visits, in September, 1905, and in February, 1906. With special reference to surgical tuberculosis, both adults and children were submitted to the treatment, which was never insisted upon, but always stopped in those cases where it seemed to be obviously useless or even injurious. The children were treated with Bier's method, in the Hôpital des Enfants-Malades, during the author's service as an interne under Prof. Broca and included two cases of tuberculosis of the elbow, four cases of spina ventosa, one case of tuberculosis of the first right metatarsal, two cases of tibiotarsal tuberculosis, one case of tuberculosis of the knee. Among adult patients the method was employed in only four instances.

From these fourteen observations, it appears that Bier's method yields only mediocre and uncertain results in surgical tuberculosis.

In the beginning tuberculoses, the most certain result seems to be the appearance of an abscess, as was noted in two instances by the author. In one case, the results of such an abscess were disastrous, the patient, a man forty-nine years of age, dying from general miliary tuberculosis.

In a case of white swelling of the left knee in a man forty-five years of age, the fungosities diminished and a fluctuating surface on the calf underwent a sclerotic change instead of breaking down. This was one of the most favorable results, but the patient could not be followed up, and it is a noteworthy fact that he was not out of bed during his entire sojourn in the hospital.

To summarize, it would seem that if the employment of Bier's band is harmless and possibly of some use in open tuberculosis, it is dangerous in closed tuberculosis. There is one condition, however, under which Bier's method may be employed even in a closed tuberculosis, namely, in the presence of a painful tuberculosis.

DEBREZ. Observations cliniques sur les méthodes de Bier. Arch. Provinciales de Chirurgie, 1909, janvier, No. 1.

The author contributes his results with Bier's method in the clinics of Prof. von Winiwarter in the University of Liege (Belgium). He points out that French literature contains but few articles on this subject and promises another communication which is to deal with tuberculous and bony affections. The present paper includes neither tuberculosis nor bone disease.

GEBELE. Ueber die Behandlung mittels Hyperæmie nach Bier. Münch. med. Woch., 1908, Nos. 3 and 4.

The experiences in the Munich surgical clinic as regards the hyperæmia treatment in tuberculosis of bones and joints were not favorable in a general way. Hot and cold abscesses very frequently appeared after a temporary improvement, the former in open, the latter in closed tuberculosis. Among eleven cases of tuberculosis of the knee joint, only two healed. Of six cases of tuberculosis of the foot and ankle joint, none healed. Results were more favorable in tuberculosis of the elbow, wrist, and shoulder joint, but only a part of the cases terminated in a cure. In a general way, the impression was obtained that tuberculosis of the soft parts, especially open cases, reacted better to the congestion than did bone tuberculosis and closed cases. The outcome of the congestion treatment was much more favorable in acute inflammatory processes. Especially in tendon sheath and bone panaritia, the results were better than those reported in 1906 by Bestelmeyer from the same clinics. The author claims that in open tuberculosis a large part of the result is mechanical.

BENNETT, W. Induced Hyperæmia as a Means of Treatment, with Special Reference to Tuberculous Joint Disease and Stiffened Joints. British Medical Journal, Nov. 21, 1909.

Hyperemia is utilized by the author chiefly as a diagnostic measure, in the initial stages of joint tuberculosis, when it is difficult to distinguish this condition from a simple chronic inflammation. The latter is promptly and positively influenced by hyperæmia, whereas this is not the case in incipient tuberculosis, according to his experience. Its usefulness begins only in the presence of stiffening suppuration or fistulæ, when it acts in the sense of accelerating the purulent process, and of controlling an existing mixed infection. Hyperæmia is an excellent remedy for stiffened joints, from both the prophylactic and the curative points of view.

WATERHOUSE. An address on Prof. Bier's Treatment by Means of Induced Hyperæmia. British Medical Journal, July 18, 1908.

The hyperæmia treatment has been employed by the author for the last twelve years, and he declares its results in articular tuberculosis to be superior to all other methods. He invariably combines injections of iodoform with the congestion bandage, however, so that his results can not be referred to the congestion alone. The advantages of the method are pointed out by him in twenty illustrative cases, taken from a large number of observations.

GEEKOFF. Congestive Hyperæmia as a Curative Factor. Russian Archives of Surgery, vi, 1908.

The author cautions against the employment of congestive hyperæmia in weakened individuals, whose general condition has been disturbed by chronic processes. In such cases, the chronic suppurations and necrobioses, etc., are said to be affected in a very unfavorable manner by congestion. In a general way, however, notwithstanding his limited material, the author has been led to form a good opinion of hyperæmia as an adjuvant in the treatment of surgical affections.

ASSNY, PAUL. Ueber Behandlung mit Hyperæmie nach Bier. Arch. f. klin. Chir., lxxxviii, 1908–9.

Acute inflammations and surgical tuberculosis form an extremely large contigent of the cases coming under the observation of the author, who is connected with the German Consulate in Chung King, Western China. There was accordingly abundant opportunity for testing the effects of the hyperæmia treatment. It is very striking that a decided improvement follows in many cases after a few sessions (congestion combined with suction), in open joint tuberculosis with fistulæ and severe secondary infections. The joint becomes painless, the swelling and redness subside. The fever which is usually present disappears; the appetite improves, and the general condition of the patient is often improved in a very remarkable manner. Patient and physician become imbued with a most hopeful spirit as to a prompt recovery. Almost invariably, however, there ensues a very considerable retardation of the progress at the end of two or three weeks. After the treatment has been continued for many months a fistula will occasionally close, and the joint in favorable cases may become painlessly movable, and perhaps even conditionally useful.

Summary of results with hyperæmia treatment. Hyperæmia is capable of exerting a favorable influence upon tuberculous affections of the bones, joints, and soft parts, which may heal with sufficient perseverance on the part of patient and physician, preventing a mutilating operation. The rapid initial results in cases of joint and bone tuberculosis, and in tuberculosis of the soft parts, often with small fistulæ, are based upon the removal of the secondary infection and its sequelæ.

PANZACCHI, G. L'edemizzazione e la stase alla Bier in ortopedia. Atti del II Congresso della Soc. Ortoped. Ital., 1907.

The congestion method of Bier was employed by the author in a number of cases of bone and joint tuberculosis. He applied his treatment at two different periods: either in the florid stage of tuberculosis, when it served to attenuate the process; or in the stage of repair, which was rendered less adherent, diminishing the tendency towards fixation. In a few cases of tuberculous arthritis of the knee joint, especially of the synovial type, he was enabled to obtain a cure with a functional outcome of fair mobility. Noteworthy improvement was likewise obtained in tuberculosis of the bones of the foot.

SEE ALSO

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AUFFRET. Revue d'orthopædie, 1906, 2 ser. vii, 481. La méthode de Bier dans la tuberculose.

JERUSALEM. Zeit. f. orthop. Chir., 1908, xxi, 265. Zur Behandlung von Kontracturen und Ankylosen. Erfahrungen mit den grossen Bier-Klappschen Apparaten.

BERRY. Bier's Method of Treatment by Congestive Hyperæmia. Albany Medical Annals, 1907, 276.

WYMAN. Virginia Medical Semi-monthly, 1906–07, xi, 359.

BIER. Cent. f. Chir., 1894, No. 30. Weitere Mittheilungen über die Behandlung Chirurgischer Tuberculose mit Stauungshyperæmie.

BIER. Esmarch Festschrift, 1893. Behandlung chirurgischer Tuberkulose der Gliedmaassen mit Stauungshyperæmie.

BIER. Verhandlungen der Deutschen Gesellschaft für Chirurgie, 1892, i, 91. Ueber eine neues Verfahren der conservativen Behandlung von Gelenk Tuberculose.

BIER. Verhandlungen der Deutschen Gesellschaft für Chirurgie, 1894, p. 94. Weitere Mitteilungen über die Behandlung chirurgischer Tuberkulose mit Stauungshyperæmie.

BIER. Hyperæmie als Heilmittel. Leipzig. F. C. W. Vogel, 1907.

MIKULICZ. Cent. f. Chirurgie, 1894, No. 12. Zur Behandlung der Tuberculose mit Stauungshyperæmie nach Bier.

BROWN. Lancet, June, 1893, p. 1514. The Treatment of Tuberculous Disease of Joints by the Induction of Local Edema.

PAGE. Lancet, Nov., 1892, p. 1157. On the Method of Esmarch and Bier for the Conservative Treatment of Tuberculous Joints.
BUSCHKE. Deut. med. Woch., 1893, 35, p. 835. Ein erfolgreicher Versuch mit der Behandlung von Tuberculose der Extremitäten mittels Stauung nach Dr. Bier.
HILDEBRAND. Tuberculose und Scrofulose. Deutsche Chirurgie, 1902, Lief 3, p. 266.
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BLECHER. Deut. Zeit. f. Chirurgie, lx.
BRADFORD. Boston Medical and Surgical Journal, June 14, 1906.
ADAMS. New York Medical Journal, Aug. 18, 1906, p. 336.

A CONTRIBUTION TO THE HISTORY AND TECHNIQUE OF EXTRAPERITONEAL CÆSAREAN SECTION

BY THEODORE J. DOEDERLEIN, M. D., CHICAGO, ILLINOIS
Attending Obstetrician, German Hospital; Associate Gynecologist, Deaconess Hospital

WHEN Veit of Halle, in order to render Cæsarean section reasonably safe, i. e., as safe as an ordinary laparotomy, sends a patient with a contracted pelvis to his clinic, two to three weeks before labor, allows only occasional vaginal examinations with sterilized hands, and, if all these requirements cannot be met, advocates a limitation of this method of surgical intervention to those cases only where there is absolutely no alternative, or, as he expresses it, "a limitation to the utmost," he may seem to under-rate the capabilities of modern surgery and to magnify the dangers involved in Cæsarean section.

Statistics of Cæsarean section of the last five to ten years are so encouraging, that most operators approach this operation with less hesitation than formerly, and the very limited field of indication, in consequence, has of late been considerably widened. Still these favorable reports are deceptive, as they do not present the true state of affairs. True it is the mortality in clinics has been lowered to from 3 to 5 per cent. If, however, we collate all cases reported to the various health offices throughout the land, the reporting of which has been compulsory in certain countries, the mortality rate of Cæsarean section suddenly rises to stupendous heights, to 25 and 35 per cent, a rate higher than that of the worst epidemic of Asiatic cholera. The laity, therefore, is still justified in its traditional fear of this operation, the very word "Cæsarean section" having been considered equivalent to a death sentence.

That the profession during the last decades was fully alive to the shortcomings and imperfections of this operation is clearly demonstrated by the attempts to find methods of evading Cæsarean section. Symphysiotomy and hebosteotomy appeared, operations involving the wounding of soft parts including bone tissue in a surgically highly unfavorable location because of its great liability to infection, to hæmorrhage and to wounding the bladder, whereas Cæsarean section may be done in the most favorable and easily accessible location, without great danger of hæmorrhage, and in case it does occur, with the possibility of easy control, and at the same time insuring greater safety to the child.

To a careful observer it seemed that obstetricians loved Cæsarean section, its nicety and accuracy, that they all agreed on the fact that it is the most scientific and, if successful, the most satisfactory and gratifying to both patient and physician, but that this love was merely platonic; the average operator, if suddenly confronted with a case of absolute indication for some sort of surgical intervention to relieve the mother, would much rather resort to hebosteotomy, craniotomy, or morcellment, sacrificing the life of the child. Thus Frank of Cologne, in his first publication on extraperitoneal Cæsarean section says: The fact that all operations for the increase of pelvic diameters were welcomed so enthusiastically by the profession is a priori sufficient proof that our present methods of Cæsarean section are unreliable and do not reach the high standard of present day surgery.

From time immemorial the principal danger of classical Cæsarean section was infection, a danger by no means set aside when Weichselbaum commenced to teach his students the first principles of asepsis in the lying-in chamber and Lister's discoveries opened the way for almost absolute safety in intraperitoneal operations. The deadly peritonitis following Cæsarean section comes, as we all know, from within, from a contamination of the peritoneal cavity with the highly infectious lochia during operation or through leakage from the uterine wound post operationem. This was also known to older surgeons, for they noticed that often healing of the uterine wound was not by primary intention. Therefore, some even recommended not to suture the uterus lest this might retard contraction and involution, and Porro in 1877 advised removal of the entire uterus.

Even Saenger's rehabilitation of Cæsarean section in 1882, which, by its removal of almost all possibility of post-operative leakage, not only superseded Porro's operation, but also all suggestions aiming at finding a way into the uterus without invading the peritoneal cavity, was not sufficiently reliable to meet the exactions the present age is justified in making. In spite of a most careful sero-muscular suture general peritonitis often sets in on the third or fourth day due to sloughing of the uterine wound. The lifting out of the pregnant uterus from the abdomen not only contuses the tissues and may cause respiratory effort on the part of the fœtus, but also may be conducive to severe shock to the patient, not speaking of the increased liability to hæmorrhage from passive congestion of womb incident to its constriction by the abdominal wound, the danger of visceral adhesions and of hernia. This led Frank to take the initiative in reviving the almost forgotten operation of extraperitoneal invasion of the uterus, the history of which I will briefly sketch.

Il n'y a de nouveau, que ce qui est oublié, où ce qui a vieilli — there is nothing new under the sun. It is a curious fact, that often works of general usefulness are completely forgotten until rediscovered by accident or after necessity has prompted a search for such works.

When Ambroise Parè, in 1549, recommended podalic version he only repeated an operation practiced one thousand years before by Amida and which had fallen into oblivion by the fact that Paul of Aegina omitted to describe it in his text-book. When Mayor of Geneva, in 1818, and Lejumeau de Kergaradec in 1821 directed the attention of the profession to the auscultation of the fœtal heart-sounds they rediscovered a phenomenon which seemingly Phillip le Goust had taken note of two hundred years previously, as he in his "Humani foetus historia" compares the rhythm of the fœtal heart-sound to the clatter of a wind-mill. (v. Winkel, I, 1). More recently Morisani again brought to light the operation of symphysiotomy proposed and performed by Sigault a century and a half ago. Thus Frank only rehabilitated a method the idea of which had suggested itself to Joerg a hundred years before.

Joerg of Leipzig, having seen in the clinic of his teacher, Boër, that ruptures of the vagina were less dangerous than ruptures of the uterus, in 1806 recommended a method of Cæsarean section in which the vagina instead of the fundus uteri is incised. His operation is described in his "Systematisches Handbuch der Geburtshilfe." Unfortunately his original report could not be found. Although Joerg avoided the highly vascular uterus, probably regarding hæmorrhage as the principal danger, he still opened the peritoneal cavity by the ordinary, the Deleurye, incision in the linea alba. His idea of low internal operation, however, suggested to Ritgen of Giesen the suprapubic incision and invasion of the uterus through the cavum Retii. Thus in Ritgen the idea of approaching the pregnant womb extraperitoneally in Cæsarean section really finds it genesis. As this investigator's report may be of great interest just at present and not easily accessible I append his description of his operation as it appeared in 1825 in the "Heidelberger Klinische Annalen":

1. The obstetrician standing on the right side of the patient introduces a male catheter into the bladder with which this organ is pulled and held to the left side by an assistant. Another assistant draws the uterus toward the left thus putting the skin of the right side on a stretch. 2. A curved incision from the crest of the ileum down to the symphysis pubis

through skin and muscles to the peritoneum is made. 3. The subperitoneal cellular tissue now is bluntly dissected with fingers, and if necessary with instruments until one reaches the lateral wall of the vagina. 4. Now a pointed sound, "Pfeil sonde," is passed into the vagina and its wall lifted toward the operator, while the womb is firmly drawn to the opposite side, thereby crowding the vagina into the incision. 5. The sharp sound now is forced through the vaginal wall and from the puncture an antero-posterior incision is made with a bistoury. 6. The flap of the vaginal wall attached to the right side of the cervix is now split up to the cervix. 7. The wound is covered with a soft piece of cloth saturated with oil and spontaneous delivery is awaited, being aided by drawing the womb to the left side. If necessary the cervix may be incised. 8. After delivery of child the wound is cleaned and muscle and skin are sutured. The vaginal wound is left to take care of itself.

In October, 1821, an opportunity to apply his method presented itself to Ritgen. The patient had osteo-malacia, and her pelvis was deformed so much that the head bulged out above the receding pubis, which condition suggested to the attending physician that Ritgen's operation might be of benefit. Ritgen operated the patient under opium in her home. He was able to carry out his plans to perfection, expose the vaginal wall without especial difficulty or hæmorrhage, and deliver a living robust child. The faint the patient had fallen into from the ordeal yielded to stimulation and she rested well. The over enthusiastic attending physician now insisted on the employment of the manifold remedial agents ("polypragmatische ordinationen") of that age, among them hot poultices over the abdomen, for which reason Ritgen withdrew from the case because of the increased liability to hæmorrhage this treatment would produce. The patient gradually failed and died after sixty hours, presumably from hæmorrhage. The post-mortem findings revealed enormous clots in wound and uterus, un-united wounds, but no pus. Although obstetricians and operators of that time might have regarded death as due to wrong after treatment rather than operation Ritgen's method seemed to sink into its grave with the unfortunate patient.

About this time, in 1825, we read in Dr. Dewees' Compendious System of Midwifery, of a similar method of extraperitoneal Cæsarean section planned and executed by an American physician, Physsics by name. Horner, a friend of Physsics, mentioned this in a letter to Dewees. According to Horner, Physsics, a most skillful surgeon, made a cross incision directly above the pubis bluntly dissected through the submuscular cellular tissue and then dissected the peritoneum off the moderately filled bladder. After thus exposing the cervix he incised it transversely through which opening the fœtus is delivered.

Physsics' method differed from Ritgen's in external incision and in opening the parturient canal. Ritgen opened the vagina, Physsics, the cervix and followed the more difficult median route. Two things characterizing our most modern methods of extraperitoneal Cæsarean section here are met with for the first time: moderate filling of bladder to produce a topographical guide and opening of cervix. Physsics' operation was not favorably received by the profession until fifty years later when Thomas took it up and applied it with success.

About the year 1825 it seemed as if all minds of surgeons were bent on finding an extraperitoneal method of Cæsarean section, since not only in Germany and America we find investigators presumably independent of each other, follow the same plans but also see Baudelocque in France making experiments and investigations with the same object in view.

In the year 1823 Baudelocque, le neveu, recommended two ways of approaching the vagina, one, like Ritgen, by laterally entering and dissecting up the peritoneum from the iliac fossa, the other, like Joerg, by opening the vagina transperitoneally. He tried his method, the technique of which he had previously tried on the cadaver, on two cases both terminating fatally, one by hæmorrhage, the other by septic peritonitis. Baudelocque was so discouraged by his failure, that he not only abandoned his method but later even published an article ridiculing his method. (Operation Cesarienne, elytrotomie, ou sec-

tion au vagin précédè, ou non, de la ligature, ou de la compression de l 'artère iliaque interne.)

Although Baudelocque and with him the French medical fraternity were opposed to this new operation, Caruso in the Arch. di Ost. e Gyn., 1884, says that Testa of Naples in 1858 had interested himself in Baudelocque's work and had published a modification of Baudelocque's method, uniting the lateral incision with a median one in order to get a larger opening. In spite of this, however, the bladder was mistaken for the vagina and opened twice. After finding and opening the vagina a living child was extracted, but the patient died shortly thereafter.

Thus far all operators from Joerg to Testa had fatal results. Of Physsics' results apparently nothing is recorded. It remained for Dr. Theodore Gaillard Thomas, Professor of Obst. and Gyn. at the College of Physicians and Surgeons, New York, again to bring to light, to perfect and first successfully to perform this operation. In the year 1870 Thomas published an article in the American Journal of Obstetrics in which he expresses his belief in the feasibility of extraperitoneal Cæsarean section and its superiority over the old method. He furthermore states that he had made dissections and anatomical studies of the parts involved in this operation long before he had heard of Joerg's and Ritgen's work in that line. Although all operations by this method had so far terminated fatally he thought this due to faulty technique and other unfavorable circumstances rather than to shortcomings of the method.

The first opportunity he had to perform his operation was on a full-term gravida, who had died of eclampsia. He describes the operation in substance as follows: After dilating the cervix with the hand, he made an incision from the symphysis pubis to the right anterior-superior spine of the ileum down to the peritoneum, which latter he could easily separate and push upward, so that with a few sweeps of the fingers he had the vagina and cervix exposed. Then he cut through vaginal wall using as guide a sound introduced into the vagina and held by an assistant. The opening was quickly enlarged by cutting and stretching and the cervix was drawn through it into the external wound by means of a blunt hook. The fœtus thereupon was easily extracted.

The ease and expedition with which the cervix could be reached by this route encouraged Thomas to make further attempts in that direction, so when called upon to save, if possible, the life of a child in a moribund patient, he again used his extraperitoneal method and found it equally practical. The child being premature and in all probability poisoned by the pneumonic toxins of the mother died shortly before the patient an hour later.

It was obvious that the operation was in no causative relation to the death of either mother or child, and Thomas thought this method a justifiable procedure when called to make a Cæsarean section to save mother and child.

The patient was a primipara of 20 years, a cripple of dwarf growth, one leg, distorted by contractures, was fairly drawn up over abdomen, her conjugata vera $2\frac{1}{2}$ inches, and fœtus in breech presentation. Having exposed and opened vagina according to described method a pain brought the fœtus through the incision into the iliac fossa and extraction was very easy. The operation lasted thirty-five minutes, mother and child lived. The bladder had been wounded somewhere but the fistula healed very quickly.

Long before Thomas had an opportunity to apply his method himself on the living subject he had interested his friend, Dr. A. J. G. Skene, in his operation. In his article, published in 1876, Skene reports two successful cases. In both cases he wounded the bladder, but says it was due to faulty technique and could be avoided. In both cases mother and child survived the operation.

In the year 1878 the Am. Gyn. Society in session in Philadelphia discussed the question of gastroelytrotomy, as extraperitoneal Cæsarean section had been designated (*τὸ ἔλυτρογν*, the vagina). Garrigues of Brooklyn read a paper on this subject. After a historical introduction he recommended, in describing the technique of the operation, opening the vagina with the thermocautery to avoid hæmorrhage, this having caused the failures of Ritgen and Baudelocque. He regarded the method as

most promising and deemed its technical difficulties hardly greater than those of herniotomy or ovariotomy. He proposed the employment of gastroelytrotomy in place of craniotomy or embryotomy in cases with a conjugata of 2½ inches or less.

Barker, Thomas, Byford, Campbell, and Bozemann discussed the paper. Dr. Byford said he was highly in favor of the operation and that he now was convinced that the danger of hæmorrhage was not as great as he had thought. Dr. Bozemann thought it was impossible to open the vagina without injuring the ureter and that the cases of supposed wounding of the bladder really were injuries to the ureter. Garrigues, who regarded Bozemann's apprehensions with regard to the ureter as justifiable, later made a careful study of the anatomical relations of ureter with actual measurements on the cadaver of the distances of ureter from uterus and cervix.

An additional report of a successful case appeared in the American Journal of Obstetrics, 1880, by Gillette, who performed gastroelytrotomy on a crippled primipara with a conjugata of 1½ inches. The child had been dead for some time and was delivered with a cranioclast. The bladder was not wounded, and the patient made an uninterrupted recovery.

Meanwhile English surgeons had given the extraperitoneal method of Cæsarean section a trial, and two cases appeared in the literature, one in the Lancet, reported by Dr. Whiteside Hime, the other in the British Medical Journal by Dr. Edis. Hime delivered a living child by gastroelytrotomy, the viæ naturales having been almost entirely occluded by carcinoma. The operation lasted twenty minutes. The patient died two hours later of exhaustion. Edis delivered a living child from a woman who died forty hours after the operation. The bladder had been wounded, but the peritoneal cavity was intact, and there was no sign of peritonitis. The vaginal cut in this case was made on a line parallel with the linea ileopectinea.

From the available literature I was able to collect eight cases of extraperitoneal Cæsarean section reported up to 1880. Thomas had two, Skene, three, Gillette, Hime, and Edis each one. The bladder was wounded in six cases. The mortality rate of the mothers reached 50 per cent, of the children 42 per cent. If we ascertain from the histories of the cases which deaths might have been directly or indirectly attributable to the operation, the operation-mortality falls, I would say, to almost nil.

Additional cases were collected by Duncan and Clark, two of Skene, one of Dunkan, and two of Jewett. I regret to state that I was unable to find the literature either in Germany or Austria, having made inquiries through the Berlin Bureau of Library Information. The mortality rate of these cases is also given as 50 per cent in the abstract.

In spite of the advantages of extraperitoneal Cæsarean section the profession in general did not regard it with favor. The close proximity of the bladder and the ureters, the danger of hæmorrhage and the difficulty of technique induced the operator of average skill and knowledge of anatomy sooner to take his chances with the more familiar method. Besides Kilian's words in his "Operative Geburtshilfe," Bonn, 1849, that gastroelytrotomy is an invention based on the mistaken notion that the invasion of the peritoneal cavity constituted the principal danger in classical Cæsarean section, may have had some bearing in shaping the opinion of many obstetricians with regard to the Ritgen and Thomas method. Above all, with the advent of aseptic surgery, came Saenger's epoch-making improvement of classical Cæsarean section. Little wonder, therefore, that even Thomas, like Baudelocque fifty years before, abandoned his gastroelytrotomy and used the Saenger sero-muscular suture in connection with intraperitoneal Cæsarean section.

If we look through the older text-books, as that of Busch, Siebold, Spaeth, Naegele, and Spiegelberg, we find that gastroelytrotomy is mentioned only as a method not to be recommended. In later text-books it is omitted entirely. Saenger and Winkel denounce it as dangerous to mother and child. On the other hand, says Schroeder in his "Lehrbuch der Geburtshilfe," 1884: "The future of elytrotomy, at present, may not be foretold, at any rate this operation first recommended by Joerg and Ritgen and perfected and successfully performed by Thomas, is worthy of notice."

I stated above why it was that modern, progressive surgeons, in spite of the fact that they had at their command an array of surgical procedures with which they could meet, one would think, almost every indication, endeavored to find still another method for the relief of birth impossible pervias naturales. Frank of Cologne deserves the credit of having redeemed from oblivion the work Thomas abandoned as impracticable.

In 1881 Frank had tried to exclude the general peritoneal cavity from the field of operation by means of a "tent" (Zelt) formed by suturing the round ligaments to the abdominal parietes and making the uterine incision low down. This operation, however, Ehrendoerffer, Saenger, and later Frank himself, believed too complicated to be generally useful. In 1907 Frank proposed a method "by means of which one may absolutely shut off or perhaps not open at all the peritoneal cavity before incising the uterus, in order to produce, as it were, artificially, a rupture of the womb outside of the peritoneal cavity." In his article published in the "Archiv. für Gynæcologie," 1907, volume 81, Frank formulates the advantages of his method as follows: 1. It avoids hæmorrhage. 2. It avoids peritonitis. 3. It increases the range of indication, i. e., patient and physician may defer extraperitoneal operation to a time when classical Cæsarean section would be contraindicated on account of exhaustion and infection.

As to technique of operation, Frank makes a cross-incision directly above pubis, cutting muscles a little higher up to leave stump for muscular suture. The external inferior epigastric is ligated and cut. After opening the peritoneal cavity the plica vesico-uterina is cut near the bladder, dissected up from the uterus and securely sutured to parietal peritoneum. Now the uterus is incised transversely and the fœtus should, if possible, be allowed to be delivered spontaneously through this channel. He states that it would be a difficult and delicate task to attempt dissection of the peritoneum from bladder, it would cause a good deal of bleeding from bladder-wall and very likely bruise and button-hole peritoneum. In rare cases the bladder is wholly disconnected from peritoneum and can easily be retracted to expose cervix. As the anatomy of this region during pregnancy has not been sufficiently studied, especially in regard to plica, he thinks it best to open the cavity and work in a clear field. After delivery the lower edge of uterine wound would sink deeply into pelvis if not secured by a tension suture. The placenta is delivered by Credè. The uterine wound is sewed up with catgut in clean cases and left open for an iodoform gauze abdominal drain in infected cases. Also an iodoform gauze drain is passed from uterus through vagina.

In his article Frank reports thirteen cases operated by his method with no death, although in only one case of the thirteen, in his opinion, classical Cæsarean section would have been indicated according to the sharply defined limitations of indication of Veit and other authorities.

Fromme, of Veit's clinic in Halle, was the first operator to adopt Frank's method. Although his first case, an infected primipara with a conjugata of 6½ cm., was highly successful with regard to mother and child, he found that several features of this operation were not according to his liking, so in his subsequent cases he modified Frank's method in several ways: he reunited the edges of the divided plica, thinking that altered peritoneal conditions might be harmful to patient; he made a vertical incision in abdomen and uterus instead of Frank's cross cut; and he closed the abdominal wound in every case when necessary, draining through vagina.

Veit and Fromme think the good results from this operation would warrant its use in many infected cases, in which, at present, pubiotomy is regarded the safer procedure, and furthermore recommended that it should be used in all primipara in place of hebosteotomy, as this operation involves extensive laceration of the narrow soft parts of a primipara.

Reading Frank's article one gets the impression that he regards a strictly extraperitoneal operation, as performed by Thomas and Skene, as ideal Cæsarean section if the danger of wounding the bladder could be eliminated. He also says that careful topographical investigation of that region would

perhaps show a way to operate extraperitoneally.

Sellheim accordingly took up the study of the hypogastric region and the changes of the plica during pregnancy. He found that the age and general bodily conditions and development of the individual influence the extraperitoneal length of the cervix; that the enlargement of uterus and cervix raises the utero-vesicle fold and bladder and that the fold is almost effaced late in pregnancy; that during labor, when the body of the uterus retracts and the cervix expands and is stretched in the line of its axis ("Axen Dehnung"), the cervix is denuded of its peritoneal covering and the plica barely touches the tip of the bladder. This anatomical state of affairs may readily be seen on the frozen sagittal section of a gravida in labor, as for instance, on Baumm's.

Encouraged by his observations Sellheim regarded the median extraperitoneal operation as comparatively easy. In his first case he pursued the following plan: In high elevation of the pelvis the cavum Retii is entered by the Pfannenstiehl incision, which, as is known, preserves the muscular structures. The peritoneum now is dissected off the lower surface of the recti. The bladder having been loosely filled so its contour is easily recognized, its peritoneum is dissected off with gauze and by blunt and sharp dissection, as needed. In the median line scissors must be used. Then the bladder being retracted downward and the peritoneum upward, the cervix is freed from connective tissue and is opened by a vertical incision in the median line. The child is delivered by lifting from within the presenting part into the wound. The uterine wound is sutured with catgut.

Sellheim operated only one case according to the method outlined above. In his subsequent cases he approaches Frank more and more in technique, operating with slight modifications of Frank's method, transperitoneally. He even approaches Frank in regard to drainage of uterus through abdominal wound, differing only by establishing a fistulous opening by suturing first the parietal then the uterine peritoneum securely to skin.

Gynecologists and obstetricians everywhere now took up the matter and soon numerous reports appeared in the literature. The late Professor Pfannenstiehl opened the bladder while trying to dissect off its peritoneum and was obliged to operate transperitoneally. Baumm, Hofmeier, Klein, Freund, Rubeska, and Wiemer were obliged to open the peritoneum in order to expose the cervix. Kuestner, Bumm, and Czyzewicz were able to work their way into the prevesical space by the extraperitoneal route in a few cases, mostly, however, they used Frank's method or a modification thereof. Pfannenstiehl and Rubeska even advised to abandon the extraperitoneal method entirely in favor of a low intraperitoneal operation, i. e., Frank's method without walling off the general cavity, and to restrict the indication to clean cases only. This would mean a return to the old classical Cæsarean section with nothing but a modification of the external incision with the Pfannenstiehl incision.

In the light of the experiences of these skillful operators it is obvious that extraperitoneal Cæsarean section is in most cases a most difficult task. The operator is quasi between Scylla and Charybdis, if he tries to keep away from the bladder he opens the peritoneum and, per contra, if he keeps at a safe distance from the peritoneum he will surely wound the bladder.

The star of extraperitoneal Cæsarean section again was on the wane and it would, for the third time, have met the fate it did after Ritgen's and Thomas' efforts if Latzko of Vienna, and especially Professor A. Doederlein, of Munich, had not improved and perfected the technique of the original Thomas operation in such a manner as to satisfy all the postulates of an apparently ideal operation. This method, as Latzko describes it in the Wiener Kl. Wochenschr. 1908, page 737, is in substance as follows: The bladder is loosely filled with about 150 cc. of water, a median incision is made ending at the symphysis. Working down to the left side of bladder this organ is pushed back on cervix. A median sagittal incision is made in cervix through which child is delivered.

At once we notice that this is a return to Thomas' way of invading the genital tract

through the paravesical space, with the unessential difference that he opened the vagina instead of the cervix. It is hardly probable, however, that Thomas worked his way past the bulging cervix down to the vagina hidden and deep in the small pelvis, with the ureters in dangerous proximity. Professor Doederlein thinks, therefore, that Thomas did open the cervix mistaking it for vagina, a mistake most easily made during labor. This would remove the only difference between the Thomas method and that devised by Latzko and Doederlein. Before giving in detail the technique of Professor A. Doederlein's operation, who, independently of Latzko, had taken up, rehabilitated, and perfected Thomas' work, I will briefly sketch the topographical anatomy concerned in this operation.

The region we invade is the subserosum prævesicale, paravesicale, and præcervicale. After dividing the posterior sheath of recti muscles we find ourselves in the cavum Retii and its continuation laterally, the cavum paravesicale. Through the loose connective tissue we get to the bladder covered with the prævesical fascia. The cavum paravesicale is related above to peritoneum, below to fascia of pelvis, externally to the internal obturator muscle, internally to the prævesical space or cavum Retii. The peritoneum is firmly adherent only in the middle line and on the posterior wall of the bladder, in all parts it is easily loosened up. It is of especial value during labor that firmly adherent peritoneum begins as high up as above the os internum. The bladder, which during labor most frequently lies in abdomen, is very movable and in disconnection from womb. The ureter varies in anatomical position in full term gravidæ. As is well known, the ureters enter the small pelvis at the bifurcation of the common iliac crossing the external iliac a little below bifurcation. It is in almost every case readily visible through pelvic peritoneum as it dips down on side of small pelvis and then courses in lower part of ligamentum latum forward and slightly inward, resting solidly imbedded in pelvic cellular tissue on lateral wall of vagina. It crosses the uterine plane at the height of the internal os above the arteria uterina and about 1½ to 2 cm. away from uterus, and thence runs forward to base of bladder. The part of ureter which naturally concerns us most in extraperitoneal Cæsarean section is the part resting on the vagina. From the close proximity to cervix and the density of tissue linking the ureter to uterus one may easily imagine how both ureters in labor resting directly on cervix are pushed laterally and are drawn up with cervix when os dilates and head cannot enter pelvis. How high the ureter may be raised above pelvic inlet by dilatation of os could be seen in a case of extraperitoneal Cæsarean section where it appeared in field of operation as soon as the paravesical space had been opened. It ran almost parallel to Poupart's ligament and 2 to 3 cm. below it over expanded parturient canal. In all other cases it was invisible. Deep dissection to expose it to view was never made in order to avoid disturbing the easily infected paravesical tissues. Suffice it to say that the ureter rarely is so dangerously near so it must be dissected up and pushed aside, its nearness, however, should always be remembered. As to blood-vessels, there are none of importance to avoid excepting the large uterine veins. In the last case I saw veins as thick as a thumb as soon as paravesiculum had been exposed. They could, however, readily be pushed aside in clearing the cervix. After delivery they had disappeared, which shows that they were varicosities.

After these anatomical remarks Prof. Doederlein's technique may be more readily understood, it is in detail as follows: The bladder, having been loosely filled, and the patient placed in an exaggerated Trendelenburg position, an incision is made on right side running from symphysis to a point a little above right anterior-superior spine. The structures are cut, according to Pfannenstiel, with transverse splitting and loosening up of fascia and pushing and retracting toward the left side of the right rectus muscle. Careful ligation of all bleeders should be made before disturbing the paravesical space. Usually the contour of bladder may be seen now. By slight dissection with the fingers the bladder may be readily seen and its attachment to the plica vesico-uterina. The cervix or lower segment of uterus is now exposed by dissecting with

fingers the loose cellular tissue from behind pubic bone, as is done, however, less extensively, in hebosteotomy, and pushing aside of bladder and peritoneum with gauze and retracting it gently. This may be done in a few seconds, and a space on cervix as large as the palm of a hand is exposed. In the most prominent part presenting in the external wound a vertical incision is made and carefully enlarged with scissors. The incision should not be larger than to allow the application of forceps to the head. In breech cases, extraction by foot is to be done. The placenta is removed by Credè or manually; time should not be lost waiting for spontaneous delivery. The uterus is packed with iodoform gauze, the end of which being passed out through the vagina. The uterine wound is sewed up with a continuous catgut suture, the loose cellular tissue and bladder stitched over the uterine suture and the external wound closed as usual. If there is suspicion of infection it is well to drain through vagina. A gauze drain may be placed down to paravesical space, from abdominal incision and removed after eighteen hours.

Prof. Doederlein thus far operated ten cases according to this method, of which I witnessed five. All of the ten mothers and children survived the operation, although some cases were brought to the clinic in a very unfavorable condition for operation. In three cases the external wound to the fascia suppurated and had to be opened and drained. All excepting one patient were primipara, all but one had rhachitis. In one Cæsarean section was made because patient had to be delivered rapidly on account of eclampsia and vagina was closed by œdema, so hysterotomy could not be made. Patient had three more eclamptic attacks on the day of operation; no more thereafter. Presentations were: left occipito-anterior in nine cases, one left occipito-posterior. The pelves of the patients were mostly of the flat rhachitic type with conjugata vera, taken intra operationem, of from 6 to 8½ cm. The children weighed from 2,200 to 3,500 grams. Labor had lasted from 24 to 72 hours before operation was undertaken. A number of children were asphyxiated; in most cases, however, I think the long-continued narcosis was the cause. The children would breathe when born and then be in a stuperose condition, breathing only on stimulation. No operation lasted longer than 25 minutes; the patient was kept anæsthetized, however, a long time before operation in some cases.

Concerning the technique of the operation, it is needless to say that this varies somewhat in every case. It usually is unnecessary to dissect back eritoneum and bladder from cervix, occasionally, however, this must be done in order to expose cervix sufficiently for delivery of fœtus. In the five cases I saw the peritoneum and bladder just had to be pushed aside with a sponge and retracted. The most prominent part presenting in the wound usually is the antero-lateral aspect of cervix. The longer the woman was in labor and the narrower the pelvis, the easier the denudation of cervix and the less liability to hæmorrhage. The hæmorrhage was most insignificant in all cases. The reason for this is that the cervix unfolds and expands mainly at the expense of its anterior aspect, away from the entrance of the blood-vessels. Thanks to the kindness of Prof. Rueckert of the Munich anatomical institute, I was permitted to observe and study this state of affairs on the anatomical specimens of the gravid uterus. One could see the crowding together of blood-vessels behind and the comparative freedom of vessels in front.

The incision in the cervix should not be larger than to allow the application of forceps to the head. Forceps hurry delivery without danger to child, and delivery is possible through a much smaller opening than would be required for manual extraction. The smallest and lightest forceps in one's instrumentarium should be used.

As to drainage. This is a most important question and still decidedly sub judice. von Rosthorn says a drain in this locality is a double-edged sword, it may drain in as well as out. In cases in which infection is probable, it would certainly be better to drain right away instead of being obliged to reopen the wound later. Our suppurative case was, as I said, from fascia only. It is a well known fact and recently again emphasized by Schauta that the much favored Pfannenstiel incision predisposes greatly to suppuration and should

not be used in infectious cases. Whether the Pfannenstiehl or vertical incision should be adopted in the average case, so to say, on the border line between infected and clean, further observation must teach. So much is certain, that Pfannenstiehl incision yields the best exposure of paravesical space. The position of patient on operating table varies with different operators, some use the horizontal, most operators prefer the Trendelenburg position.

As to range of indication of extraperitoneal Cæsarean section, authorities differ widely. Schauta thinks that extraperitoneal Cæsarean section was not given to the profession to replace classical Cæsarean section, but simply hebosteotomy. Although Prof. Doederlein would like to see the extraperitoneal method used in all cases where ordinary Cæsarean section is indicated, as also in some cases hebosteotomy and craniotomy otherwise would be resorted to, I believe that in absolutely clean cases classical Cæsarean section will hold its place as the operation par excellence, because it is beyond doubt the easier operation. There are, however, a great many doubtful or positively infected cases, cases in which craniotomy cannot be made because of the ardent desire of the parents for offspring or of religious scruples, or exaggerated contraction or distortion of pelvis, in such cases I would certainly prefer to take my chances with a possible abscess in the cavum paravesicale than a septic peritonitis.

Two further objections to this method are raised, and these are: inability to sterilize patient, and danger of rupture of uterus in scar in later pregnancies.

As to sterilization. I think it is a question of secondary importance at a time when the patient's life may depend on the selection of this or that method. Very often sterilization is not desired. The abandoning of the Porro operation was partly due to the sterilization it involved.

As to possible rupture of the uterus in later pregnancies, it is useless to speculate at the present time, the future will teach us. Rupture of uterus in scar of classical Cæsarean section occurred repeatedly with fatal result, of course. Whether a rupture into the paravesical space would be absolutely fatal, I would doubt.

A few words as to nomenclature. The old word gastroelytrotomy implies opening of vagina and, therefore, cannot properly be used. Hofmeier recommends that the term Cæsarean section should, by right of tradition, be reserved for all operations for delivery of fœtus above pelvis. The term vaginal Cæsarean section, as Duerssen called his obstetrical operation on cervix, should not be used, as it confuses the student; often the peritoneal cavity is not even opened during this operation. Bumm proposes the name of hysterotomia vaginalis for this operation. To distinguish between the method of Cæsarean section we have the adjectives intra-, trans-, and extraperitoneal.

As I pointed out above, Theodore Gaillard Thomas deserves the credit not only of careful experimentation with this operation but of first applying it with success clinically. He is the originator of the idea of invasion of the uterus through the paravesical space, which at present is the method of Doederlein and Latzko. Since we have the custom of designating certain methods of operation by the names of their originators, as e. g., the Wertheim operation, the Alexander-Adams operation, etc., it would be logical and doing justice to Dr. Thomas to call extraperitoneal Cæsarean section the Thomas operation.

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DEPARTMENT OF TECHNIQUE

THE TREATMENT OF ABORTION[1]

With a Brief Report of 750 Cases Occurring in the Out-door Department of the Chicago Lying-in Hospital

By HERBERT MARION STOWE, M. D., Chicago, Illinois

Associate in Obstetrics, Northwestern University Medical School; Attending Obstetrician to Cook County, Provident, and Prospect Hospitals; Adjunct Obstetrician to Wesley Hospital; Assistant Obstetrician to the Chicago Lying-in Hospital

Abortion is unfortunately a common termination of uterogestation. While statistics are oftentimes unreliable in furnishing accurate deductions regarding its frequency, it is probable that abortion occurs once in every six or seven pregnancies. A large number of cases of retarded menstruation followed by profuse hæmorrhage are undoubtedly instances of early abortion. These cases, as a rule, do not come under medical care. While the diagnosis of abortion may be difficult, the interests of the patient are best served when the condition is treated as acute abortion. The predisposition to get up immediately after the ovum is lost or not to go to bed at all is prone to interfere with proper involution of the uterus and to lay up for the future a potent pathology.

The treatment of abortion is a matter of general and peculiar interest because these patients usually fall to the care of the general practitioner, and further, because of the opportunity afforded him to protect his patients from the future malign effects of this unfortunate accident. The disastrous results following streptococcic infection in abortion are almost too well known to mention, yet the fact that sepsis following abortion is on the increase emphasizes the importance of calling the attention of the profession repeatedly to this point.

In order to study the treatment of abortion, it is necessary to divide the subject into groups in which certain conditions are present and certain indications are to be fulfilled. The proper grouping of these cases is wholly dependent upon a correct diagnosis and this is obtained by a careful physical examination. The findings are studied in connection with the clinical history when the abortion is not criminal in character.

THREATENED ABORTION

A diagnosis of threatened abortion depends primarily upon a diagnosis of pregnancy, a difficult matter in the early months before definite signs are demonstrable. If the existence of gestation is dubious, every woman in the childbearing period who suffers from uterine hæmorrhage and intermittent pelvic pain should be treated for abortion. The patient usually gives a history of hæmorrhage for a number of hours or days. The blood comes from a slight separation of the decidua from the lower uterine wall. It may come in spurts or as a slight oozing. In the latter case, the discharge is brown in color. This oozing may continue for weeks — stillicidium sanguinis — and its effects upon the patient may be such as to produce marked anæmia. The patient complains of certain subjective symptoms such as pain in the sacrum and lower abdomen, pressure on the bladder, and slight tenesmus. In addition to the hæmorrhage, internal examination shows that the lower uterine segment is contracting. The internal os is closed or slightly dilated. The thickening of the fundus anteroposteriorly shows that the ovum is attached high up in its normal position. The lower uterine segment is undilated.

If, under proper treatment, the contractions are arrested and the bleeding stops, the pregnancy continues to develop if the ovum is alive. In other cases the condition may be relieved for a time. Later, the bleeding recurs and the ovum is forced out of the fundus and the abortion becomes inevitable. Less frequently, the ovum dies but is not expelled until weeks or months later as a blood mole.

The chief points in the treatment are rest in bed, the administration of drugs having a sedative action on the uterine contractions, and the avoidance of all local irritation. All the authorities are agreed upon the treatment of threatened abortion. Absolute rest in bed should be secured at once and is to be maintained as long as the bleeding continues or until the abortion becomes inevitable.

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If the hæmorrhage ceases, the woman may leave her bed cautiously, and upon a recurrence of the bleeding, she should return to her bed. Opiates, either as morphine or codeine, are preferred to arrest uterine contractions when they are painful to the patient. If they are not painful, or if they are relieved by opium, viburnum prunifolium is a valuable adjuvant. The bowels should be relieved by mild cathartics, preferably magnesium sulphate. Lange recommends that the patient lie on her side and claims that when lying on the back, the exit of blood from the uterus is favored. The side position favors the formation of clots and tends to prevent hæmorrhage. Both hot and ice cold drinks are to be avoided and ice packs over the lower abdomen frequently result in hastening the abortion.

It is important to know for how long a time our efforts to save the pregnancy may be continued. Theoretically, we should persist in the expectant treatment as long as the ovum is alive and the bleeding is not detrimental to the mother's health. When the ovum is dead it should be removed from the uterus. Practically, we are compelled to judge of the vitality of the ovum in the early weeks of gestation by the associated signs, namely, the amount and character of the uterine discharges, the contractions and changes in size and contour of the organ. If the patient passes a number of large blood clots, if the hæmorrhage is profuse, if the uterine contractions are not controlled by opiates, we may consider the case as one of abortion in progress.

In such a case, an internal examination reveals a relatively soft and dilated lower uterine segment. The internal os is more or less dilated and the finger is often able to palpate the lower pole of the ovum. In the primiparous woman, the upper cervical canal is dilated and may contain a portion of the separated decidua or the entire ovum itself, depending upon the progress of the abortion. The fundus has a distinctly soft and flabby consistency. In chronic cases, the fundus is hard and retracted.

If the cervix remains closed and bleeding persists, we must judge of the vitality of the ovum by the quantity of blood lost. The maximum amount a patient can lose without destroying the gestation varies considerably. Necessarily, a hæmorrhage in the upper portion of the decidua is more fatal to the ovum than one occurring near the internal os. Thus we see abortion in progress with only a slight hæmorrhage, while instances are not wanting where a loss of from five to thirty ounces is not incompatible with the preservation of gestation. A uterine hæmorrhage is more serious when occurring in the early weeks of pregnancy. In the chronic form, a patient can lose more blood than in the acute variety. A sudden profuse bleeding usually denotes an inevitable abortion. Expectant treatment is permissible in chronic hæmorrhage, provided the drain does not overtax the patient's strength and vitality, and the constantly growing uterus proves that the child is alive. This bleeding frequently stops at the fourth month. If the uterus ceases to increase in size, we may infer that the ovum is dead and degenerated and its removal is called for. To delay active treatment is to invite infection and further loss of blood. Should the contents become infected, a continuance of gestation is impossible.

When it is decided that the abortion is inevitable, the treatment depends upon the conditions present when the patient is first seen. This treatment will be taken up seriatim.

TREATMENT OF INEVITABLE ABORTION

1. *Cervix closed. Fœtus and decidua in utero. Hæmorrhage.*

In the present classification, a closed cervix is one that will not permit the passage of a finger as far as the fundus. The occurrence of hæmorrhage in inevitable abortion calls for active treatment. If the source of hæmorrhage is located in the lower portion of the vera, the loss may be serious. If situated higher up, the oval mass acts as a plug and severe hæmorrhage is the exception until the fœtus is expelled. If bleeding is slight but continuous, treatment should be instituted to save the mother from prolonged asthenia and debility.

The older methods of treatment, namely, administration of ergot, hydrastis, and quinine, ice bags or cold compresses on the abdomen, vaginal and intrauterine irrigations, are all inefficient and useless because valuable time is lost. The method of election in these cases is the vaginal tamponade.

A properly introduced tampon usually arrests the bleeding when the vagina is small and resistant — primiparæ. One great advantage of this treatment is that it does not interfere with the normal mechanism of abortion but affords a sufficient time for the spontaneous separation of the decidua. By irritating the nervous ganglia in the anterior vaginal wall, it tends to increase the efficiency of the uterine contractions if already present, but its power of initiating pains is somewhat feeble. The technique can easily be mastered and the material is available in all cases.

The tampon is not always effective. If the vaginal walls are relaxed, it may be difficult to retain it in position and maintain its effectiveness.

If the ovum is intact and uterine contractions are absent, the vaginal tampon is useless in terminating the process. Bleeding is only arrested until the tampon is removed. It then recurs. Exceptionally, during a tamponade, the cervix closes, bleeding stops, and the gestation continues. Bleeding may also continue on top of the tampon and seriously affect the mother. This is shown in Klotz' case. His patient was thirteen weeks pregnant and had bled for four weeks After a severe bleeding for one hour, a vaginal tampon was introduced. The next morning the patient collapsed, though no blood appeared externally. The uterus had attained the size of an eight months' pregnancy and was filled with blood. The woman died one hour later.

Another drawback is the danger of sepsis and entrance of air into the placental sinuses. Sepsis can be avoided by proper antiseptic precautions and the use of proper packing material. Drainage is always interfered with during the continuance of a tampon, but this is of little consequence in acute abortion. If pyogenic cocci are present in the upper vaginal vault, the tampon may further their activity. Sellheim, Chazan, and the great majority of the German operators prefer 10 per cent iodoform gauze for plugging. At the Chicago Lying-in Hospital, cotton pledgets are used. The writer has seen several cases where a gauze tampon was unable to stop a hæmorrhage while the cotton pledgets were sufficiently hæmostatic, and yet both tampons were inserted by the same person.

The patient lies in the dorsal position across the table or bed and a careful disinfection is made of the field of operation. A too vigorous scrubbing of the vaginal walls is deleterious, as the pavement epithelium may be scraped off and sepsis favored. The urine is withdrawn by a catheter and a vaginal douche of one-half per cent lysol solution is given. The pledgets are wrung out of the lysol solution as they pack better and prevent the blood from soaking into the material. They are introduced with De Lee's packing forceps and packed into place with two fingers of the left hand. The first row is placed around the cervix and the vaginal vault is firmly packed. The lower canal is filled more loosely in order to prevent pressure on the urethra and bearing down sensations. A T binder supports the whole. This tampon is allowed to remain twelve to twenty-four hours, not longer. The liability to septic infection renders a longer retention dangerous. Danger is denoted by temperature and a rising fever or recurrent hæmorrhage calls for the immediate removal of the tampon.

When the tampon is removed, the findings depend upon the progress of the abortion. If the contractions have been effective, the entire mass may be expelled on top of the ovum. The abortion is then complete and further local treatment is unnecessary. More commonly, the cervix is found dilated and the decidua is to be removed manually as outlined below.

2. *External os closed. Fœtus and decidua in cervix and uterus. Hæmorrhage absent.*

These cases are more rarely met with and are commonly associated with cervical abortion. The ovum has descended more or less into the cervical canal, but on account of the rigidity of the fibres of the external os, no dilatation has occurred. The difficulty is to differentiate from threatened abortion. If the uterine fundus is large and bulbous while the cervix is thin, the abortion is threatened. If the opposite condition is found, a cervical abortion is present or the abortion is in progress. A certain amount of blood collects in the uterine cavity. Cervical abortion is best treated by dilating the fibres of the external os artificially either with the fingers or Hegar's dilators. When the resistance of these fibres is overcome, the remaining dilatation is often accomplished by nature if the contractions are strong. In such cases, the patient is left alone, provided she is in a hospital or skilled assistance is available. This precaution is to insure immediate assistance in case a sudden hæmorrhage occurs subsequently. If the patient is placed where such assistance is not available, the vaginal tampon is valuable as a prophylactic measure, as hæmorrhage is inseparable from abortion in its later stages. No attempt should be made to rupture the membrane as this tends to prevent the expulsion of the intact ovum.

3. *Cervix dilated. Fœtus and decidua in utero. Hæmorrhage.*

The ability to pass one or more fingers into the uterine cavity removes one of the greatest obstacles in the operative treatment of abortion. In many cases the process will terminate spontaneously but the hæmorrhage offers an imperative indication to interfere and terminate the process at once.

The first procedure is to ascertain whether the ovum has become separated and detached. Generally, the inferior segment is loosened and the bleeding issues from this area. Using the gloved finger as a curette, the mass is gently and systematically detached from the uterus. This maneuvre is best accomplished when the pregnancy is in the second and third month. If necessary to reach the fundus, it is advisable to pass four

fingers or the whole hand through the vulva, a matter of little difficulty in multiparous patients.

When the mass is separated, an attempt is made to remove it manually, and this is possible in a great majority of cases. In certain cases, manual removal may be difficult or impossible, as in rigidity of the cervix with large fœtus, thick abdominal walls, small perineum or vaginismus, displacements of the uterus due to pelvic disease may interfere with its performance. The great advantage of the sensitive and living finger is everywhere admitted.

If manual removal cannot be done, Hoening's abdominovaginal compressions may be tried. This method was first described by Hoening and later recommended by Budin and Ahlfeld.

Certain contraindications may exist which render its performance hazardous or difficult.

1. Lack of thorough separation of the decidua from the uterine wall.

2. Insufficient dilatation of the cervix to permit a passage of the ovum.

3. Rigidity or hypersensitiveness of the abdominal walls, also obesity, rendering external manipulation difficult.

4. Retroflexion of the uterus.

5. Inflammation or infection of the adnexa or periuterine tissues rendering external manipulation dangerous.

The technique consists in passing two or more fingers to the posterior cul-de-sac. The external hand is applied over the abdomen where circular massage and counterpressure is made. The uterus is caught between the two hands and all fragments are expelled into the vagina. If the uterus lies in anteflexion, the method is easier, less painful, and more effective because of the greater accessibility of the fundus.

Hoening's method only removes the loosened fragments, hence its effectiveness depends upon the preliminary preparation. In a few cases, a secondary hæmorrhage has necessitated further operative procedures.

Budin is an active supporter of this treatment. He advises narcosis, preliminary digital separation by two fingers, removal of all large pieces digitally, and the remainder by abdominovaginal compression. Maygrier and Demelin have obtained excellent results and recommend the method highly. Jacub used digital removal and Hoening's method successfully in 40 consecutive cases. He states that the curette and all instruments are dangerous in these cases. Gessner claims that it is possible to remove all the large pieces by Hœning's method and the remainder can be so destroyed that they are removed by a douche. Larigaudry recommends the method when digital removal fails. He places the patient under deep anæsthesia, breaks up the fœtal mass into fragments and completes the process with bimanual compression. He reports ten successful cases. Stratz, who used the curette only five times in 486 abortions, recommends digital removal in all cases. If this is impossible, Hoening's method should be tried under deep anæsthesia if necessary.

When the mass has been removed, the hæmorrhage usually ceases and further local measures are to be avoided. Exceptionally, the bleeding continues or recurs after an interval and the placental forceps or curette are necessary to remove the still adherent fragments. Usually a curettement is unnecessary. No packing is necessary unless hæmorrhage from uterine atony is present. If used, it should be removed within 24 hours. The patient is to be placed on moderate doses of ergot and hydrastis to promote uterine involution.

4. *Cervix dilated. Fœtus and decidua in utero. No hæmorrhage.*

Artificial assistance is indicated in this condition when it is apparent that the uterus is unable to expel the ovum spontaneously. A prolonged retention is dangerous to the mother because of the liability of sepsis and hæmorrhage. If she has lost considerable blood already, a further loss might be serious. If the contractions are active, an expectant treatment may be followed for a time. Practically, inasmuch as all necessary conditions are present, most operators prefer to empty the uterus at once.

5. *Cervix closed. Fœtus expelled. Decidua in utero. Hæmorrhage..*

A large number of cases fall under this heading of incomplete abortion. It is common to observe contractions continuing until the fœtus is expelled. At this time, they weaken, the cervix closes down, and hæmorrhage occurs.

Opinion is still at variance on the method of obtaining sufficient dilatation of the cervix to complete the abortion artificially. The most popular methods employed are tents, steel dilators, and the uterovaginal tamponade. After the fourth month, the small metreurynter or the finger may be used.

The German operators frequently employ laminaria tents where the cervix is long and rigid. The lack of complete asepsis, the danger of introducing septic material into the uterus, and interference with proper drainage are the main disadvantages of this method. A sinuous condition of the cervix makes the introduction of tents

difficult and not a few cases are on record where such tents have been forced into the parametrium. Heinick recommends that the length of the tent be equal to that of the uterus in order to prevent it from slipping beyond the internal os. The patient suffers materially from pains from 16 to 20 hours under this treatment.

The steel dilators generally used are the Goodell instrument and Hegar's sounds. Their use in acute abortion is attended with danger unless skillfully used. The soft tissues of the cervix are easily lacerated and the tears may extend into the parametrium or peritoneal cavity. Especially in the presence of sepsis is the danger of rupture and perforation increased. The muscular fibres undergo hyalin and fatty degeneration and ultimately necrosis. If these changes are marked the dilator may perforate with only a minimum amount of force applied. Heinick has recently collected 16 cases of perforation with steel dilators. Five deaths resulted. One precaution in using Hegar's dilators is to avoid using unnecessary force in introducing the sound through the internal os. In two recent cases, the author has seen the sound slip into the uterus and through the fundal wall before the operator could control its movement. The first woman recovered after packing the uterus. The second had a large hæmatoma form under the peritoneum. This was removed by laparotomy and the perforation closed with sutures. This woman also recovered.

The method of election in cases where immediate removal is not indicated is the uterovaginal tamponade. This permits uterine dilatation by the natural powers. The utero-vaginal tamponade not only has the power to increase pains but also to initiate them after uterine action has ceased. The principal danger of this form of treatment is from sepsis introduced from below.

The indications for the uterovaginal tamponade are given by Chazan as follows:

1. When the ovum is intact and hæmorrhage is not controlled by vaginal tampon.

2. In incomplete abortion when the cervical canal is nearly closed.

3. In placental retention where the position of the uterus is such that artificial removal appears difficult or where one can wait for uterine action and this is more likely to be the case the more advanced the pregnancy.

4. In long continued and painful manipulations where former hæmorrhages have weakened the patient and where prostration is imminent.

5. In hæmorrhage from retained fragments after digital curettement. If it is impossible to remove all the fragments with fingers, the uterus may be firmly tamponed. When this is removed, the fragments are detached simultaneously.

The plugging gauze should be impregnated with an antiseptic substance, either lysol or 10 per cent iodoform (Dührssen). Salicylic and boric acids are largely used. Nihoff recommends 20 per cent iodoform gauze and permits it to remain 3 days in the uterus. Plain sterile gauze is not as valuable.

The cervix is exposed by drawing it down with volsella and after the usual antiseptic precautions, a small tubular packer is introduced into the uterine cavity and the area filled with a strip of antiseptic gauze. A portion is left protruding from the cervix to facilitate its removal later. The vaginal cavity is packed with cotton pledgets and a T binder supports the whole.

By stimulating uterine contractions, the uterovaginal tampon indirectly dilates the cervix although it does not always effect a complete separation of the decidua. The need of a mass resisting the contractions is well shown by the action of the pains before and after the fœtus is expelled. The tampon supplies this mass in an ideal manner.

The tampon is permitted to remain from 18 to 24 hours. If a patient bleeds after a number of hours, it is probable that the decidua has become separated and expelled from the uterine cavity. A second tampon is rarely indicated and repeated manipulations are to be deplored. If the cervix is found dilated upon the removal of the tampon, the ovum is to be removed digitally, aided by Hoening's method if necessary. After the debris has been removed, all local treatment is avoided.

Included under this heading are a number of cases where it is difficult or impracticable to dilate the cervix artificially. Carcinomatous or fibroid infiltration of the cervix, unyielding scar tissue, inflammatory exudates in the parametrium, exceeding friability of the cervix, or cases where a prior attempt at dilatation has resulted in deep laceration, all furnish contraindications for forcible dilatation. In such cases, an attempt is made to curette with the steel curette.

The advantages of instrumental curettage are stated to be as follows:

1. It is possible to sterilize the curette thoroughly.

2. Instrumental curettement can be done without the preliminary dilatation necessary for digital curettage.

3. Instrumental curettement may be done without narcosis while in primiparæ with unyielding abdominal walls and perineum or where the patient is very sensitive, manual curettage is impossible except under narcosis.

4. If narcosis is necessary to permit dilatation, its employment is unfavorable in severe cardiac disease or in high grades of anæmia.

5. The curette can remove fragments of decidua inaccessible to the finger.

6. In late or chronic abortion, the curette is necessary to remove the firmly adherent masses or semipolypoid formations growing upon the thickened endometrium.

The disadvantages of the curette are as follows:

1. The danger of perforation is far greater than in digital curettement.

2. If the muscular wall of the uterus is atrophic or softened, serious injury may be inflicted upon it.

3. The curette is at best an uncertain instrument in the uterine cavity as compared with the finger.

4. The curette is inefficient after the third month on account of the size of the fœtus.

5. In septic cases, the curette is dangerous because it displaces the thrombi in the sinuses, breaks down the protective wall of Bumm, and invites further infection.

6. It is often impossible to remove all decidua with a curette.

An instrument capable of inflicting so much damage should not be lightly regarded nor used with impunity. Its routine practice is dangerous in the hands of a general practitioner. In the presence of extrauterine puerperal sepsis, it should never be used.

The authorities are nearly all agreed upon the great advantages of digital over instrumental curettement and the various morbidity and mortality statistics bear out their claims.

A brief review of some of the late authorities is given to emphasize the importance of digital treatment in abortion. In Bumm's klinik from 1900 to 1903, five hundred cases of abortion were treated. The tampon was used in 496 cases followed by digital curettage. In the remaining four, digital removal was followed by a light curettement. Gessner has treated hundreds of cases *without* the curette and they all did well. He claims the finger is better and safer. Freund treated 180 cases by digital curettage, only six with the curette, and seven with dressing forceps. Sanger prefers the manual method though he uses the curette lightly after palpating the retained masses with the finger. Ohlhausen and Veit prefer manual removal or the dressing forceps under the guidance of the finger. Chrobak rarely uses the curette. Zweifel only uses the curette in chronic abortion where a small part of the decidua is retained, where uterine involution is in progress, and dilatability small. He states that no instrument can compare with the finger. Sittner prefers to curette lightly after digital curettage. Koerling advises digital curettage but states that the dangers of the curette are overestimated. Winter uses the curette only when small pieces are left and the cervix only partially dilated. Walther only uses the curette in chronic cases but also thinks the dangers of the curette overdrawn. Stratz used the curette only five times in 486 abortions and then only because ergot had been administered.

Grigoriantz removes the decidua manually if the cervix admits two fingers, otherwise the curette is used. In sixty cases, the curette was used thirty-nine times. Kuppenheim treated eighty-four cases in Heidelberg. The curette was used fifty-three times. He tries digital curettage first but if the cervix is too small, the curette is used without further dilatation. Doederlein only uses the curette in endometritis post-abortum. He dilates the cervix with tents and removes the decidua manually and always in narcosis. Gusserow and Orthmann state that the curette is exceedingly dangerous. Jacub has no use for the curette. He treated forty cases manually. Grapow claims that all pieces can be removed manually after dilating the cervix with Hegar's dilators. He uses neither curette nor dressing forceps. Huber does not believe that the curette is necessary when the cervix is small. One should dilate and use a finger. He uses the curette in very early abortion and to remove small pieces. Mueller dilates the cervix under narcosis and removes the decidua in acute abortion with a finger. All polypoid growths and strings hanging from the uterine wall in chronic abortion are removed with the curette. Maygrier uses digital removal in narcosis. The curette is only used when guided by the finger. He curetted forty-four cases out of a hundred and lost two mothers from uterine perforation. Abel always removes the decidua manually in narcosis and is always successful. Hauff dilates with Hegar's dilators and removes the decidua manually. In 275 cases, he used the curette and finger but six times. Dressing forceps were used seven times.

Franz uses the finger if the cervix is open but removes the small pieces with the curette. In 844 cases in Halle, the curette was used 709 times. Lantos only uses the curette in chronic abortion where the swollen decidua blocks the cervical canal. In 300 abortions, manual curettage was successful in 246 cases. The dressing forceps were used four times and the curette in fifty cases of chronic abortion. Leopold warns against the curette. He dilates the cervix with tents or Hegar's dilators and removes the decidua manually. Small

fragments may be removed with dressing forceps. Horschelmann dilates the cervix in narcosis and curettes digitally. The curette is only used in chronic abortion. Szabo prefers digital removal where the cervix is sufficiently dilated, otherwise he uses the curette or the dressing forceps. Beuttner curetted twenty-seven women in a series of forty cases. He claims that fragments retained after digital removal cause chronic endometritis. He uses the curette because it is not painful, requires no narcosis, and can be done through a small cervix. Fischer used a curette 69 times in 99 cases. The digital method was resorted to in thirty cases. Lowenhaupt uses his fingers wherever possible. The loose pieces can be removed with dressing forceps. The curette is used in chronic abortion but always under guidance of the finger. Narcosis is to be avoided. Lawrence curettes digitally and then paints the uterus with tincture of iodine. Ekstein uses dressing forceps to remove the larger pieces and a curette the smaller ones. This should be preceded by digital exploration. Solowij uses a modification of Bandl's speculum and removes decidual remnants with dressing forceps. If immediate removal is not necessary, he uses the tampon. This is done without assistants. Eisenberg reports good results by curettement. d'Archia reports forty-one incomplete abortions where he curetted and immediately irrigated the uterus with a one per cent solution of lysol. He uses a blunt curette under guidance of a finger. He obtained no bad results. von Braun-Fernwald uses a blunt curette where separation with the finger is impossible or is possible only under narcosis. With a curette, the fragments can be removed without pain and quickly. He does not advise its employment as a routine measure. Winckel removes the ovum manually and follows with a douche. He states that the curette is bad in all cases. De Lee advises the tampon, manual removal, and in the early weeks where the decidua is adherent and the finger too cramped to work properly, the curette under guidance of the finger. J. Clarence Webster tampons the vagina, removes the ovum manually, curettes away the smaller pieces, and gives a hot douche. In the fifth and sixth months he uses a Barnes' bag. Finally, Williams packs the cervix and vagina with sterile gauze, removes in twenty-four hours, and curettes digitally. If hæmorrhage is serious or the cervix too resistant, he uses the curette. He emphasizes the importance of using the trained finger wherever possible.

A majority of the authorities prefer the steel curette in chronic abortion where the decidual remnants are firmly attached to the uterine wall and where involution is well advanced. In these cases, perforation is the exception. If the cervix is rigid and incompletely dilated and digital removal impossible, many operators advise the curette.

Instrumental curettement is always a surgical operation and requires the assistants and surroundings that rightly belong to other operations. If these are not immediately obtainable, the patient can be packed in the interim. The work in the out-door department of the Lying-in Dispensary has been done in the most unhygienic and unsanitary surroundings imaginable and yet the best of results have obtained. This experience leads to the statement that the antiseptic environment and clean work rest entirely with the operator himself. It will be found that women living in the lower strata of life will be more immune to infection than those better cared for. The patient should always be operated on a table. Ether or choloroform is given as an anæsthetic. The anterior cervical lip is brought down to the outlet with a volsellum and the length of the organ determined by careful examination. A curette is passed over the entire uterine cavity and the decidua removed. If it is possible to introduce the finger, this should always be done. The curette should never be introduced blindly into the uterus. The tip of the examining finger is ever the eye of the curette. After the uterus is emptied, the hæmorrhage usually stops. If it continues, a hot douche is given for its hæmostatic action and to remove loose fragments. If the hæmorrhage persists, the uterus is packed with lysol gauze. Otherwise the patient is placed on ergot and hydrastis and left alone. The dictum is current that curetting should be continued until the peculiar grating sound is heard and that this sound may be elicited everywhere except over the placental area. The author has found it over the placental site as well as in the distribution of the vera. Furthermore, grating does not always indicate that the decidua is removed. Nassauer curetted a woman until the grating sound was heard distinctly. Later, the decidua was expelled and an examination showed that he had curetted only in the interior of the oval sac.

In a certain number of cases it will be found that a well-formed placental forceps will enable the operator to remove decidua wholly inaccessible to the finger, and in these cases the use of the forceps is preferable to violent manipulations with the finger. If fragments are located with the examining finger, it is usually easy to remove them with the forceps. A broad tip in the instrument will render any danger of perforation very

slight. Nevertheless, great care must be exercised as reports are on record where the operator has drawn down omentum, mesentery, and intestine to the cervix.

6. *Cervix closed. Fœtus expelled. No hæmorrhage.*

The absence of hæmorrhage gives the operator more time to rely upon those measures that tend to complete the abortion normally. If the patient is in good condition and not infected, the cervicovaginal tampon is the method of election. This stimulates normal dilatation and frequently results in spontaneous separation of the decidua. Upon removal of the tampon, the mass, if still in utero, may be removed manually combined with Hoening's method. If the cervix is undilated and manual dilatation and removal is contraindicated, the dressing forceps or curette may be employed.

7. *Should the curette be used after the complete emptying of the uterus?*

The opinion that the curette should be used after a complete emptying of the uterus is becoming less general. It is physically impossible to remove all the tissue with a curette. This has been repeatedly shown in cases where the organ has been removed immediately after the curettement. Williams states that when the ovum has been expelled intact, there is no necessity for further interference. As a rule, if the vera is not cast off, it is not advisable to attempt its removal with the curette. Dührssen has shown that the curette separates the decidua in the ampullary layer while in finger curettage and especially in the compression method of Hoening, the decidua is separated in the same layer. Puppe has shown that the decidual remnants do no harm when left in the uterus. Winter has the same opinion. Generally speaking, if all the masses palpable by the finger are removed or so destroyed that they can be removed by the douche, the finishing touches by the curette are unnecessary. It is not the experience at the Lying-in Hospital that these women commonly suffer from polypoid formations or endometritis with its various consequences.

8. *When is ergot indicated?*

The same rule applies in the early months of pregnancy as at term. Ergot should not be given until the uterus is empty. The poorly developed muscular fibres of the uterus do not respond to the action of ergot as they do at term. Later in pregnancy, ergot causes tonic contractions of the partly emptied uterus and the cervix may close down and cause difficulty in removing the remnants. Decidual debris is better separated by intermittent than by tonic uterine contractions.

9. *The treatment of septic abortion.*

In septic abortion with a poorly dilated cervix, a cervicovaginal tamponade is introduced until it is possible to pass in the exploring finger. This tampon is repeated once if necessary. If the fœtus is not expelled, it is removed manually together with the decidua. If the fœtus and membranes are expelled with the packing and no offensive uterine discharge or hæmorrhage follows, Watkins considers the uterus empty and it is left alone. No intrauterine irrigations, packing, or curetting are indicated. De Lee states that the uterus should be left alone in all cases where there is an irritation of the peritoneum or a beginning peritonitis, where acute exudates are present in the parametrium whether there is anything in the uterus or not. He teaches a rigid policy of noninterference in these cases. The author has recently called attention to the great harm in local manipulations in sepsis unless the infection is limited to the interior of the uterine cavity. If the patient is seen early, the infection is outside the general system though inside the uterus and if the protective wall of leucocytes is well formed, the infection is local only. These women will recover if left alone, provided the drainage is free. Local treatment, especially curettement, may act like signing their death certificates. Schmauch regards the uterine cavity as sacred in the puerperium. In one of the large kliniks in Berlin, every abortion with a temperature of over 102° F. was regarded as septic. It was treated at once. Laminaria tents were used and no tampon. Only a small portion of these patients developed sepsis.

10. *The after treatment of abortion.*

The after treatment of abortion is simple. The patient should lie in bed for a period of eight to twelve days, depending upon the duration of pregnancy. Small doses of ergot and hydrastis are administered daily. External douches of one-half per cent lysol solution are given every four hours and after the natural movements. A sterile pad is retained by a binder. The bowels are moved on the second day by castor oil and then daily by enemata.

From February 15, 1895, to January 1, 1909, the Chicago Lying-in Dispensary has treated 750 cases of abortion. In addition to these, forty-eight women and their cases were dropped or they were so infected that they were sent to a general hospital. Criminal abortion was found only thirty-two times though doubtless many others

were unrecognized as such. All these patients were cared for in their homes and the sanitary surroundings of many of the places can only be appreciated by those who have visited them. The women were first seen by the interne and a student and the proper treatment instituted. Packing is always done by the interne. The final operation is performed in the presence of a member of the staff.

Threatened abortion occurred 276 times (36.80 per cent). The condition was diagnosed by the history, enlarged and softened uterus, pelvic pains, and hæmorrhage. No internal examination was made in 95 cases (34.4 per cent). The patient was placed in bed at absolute rest and was given morphine (gr. $\frac{1}{6}$) or codeine (gr. $\frac{1}{2}$) every four hours. The bowels were moved with magnesium sulphate. Malpositions of the uterus or other causative factors were sought for and removed if possible. Under this treatment, the pregnancy was saved in 201 cases (72.8 per cent). Special difficulties encountered were the refusal of the patient to stay in bed and the too early resumption of work. Of the seventy-five cases lost, sixteen women left their bed before bleeding ceased. It is also worthy of record that forty-eight per cent of the women who finally miscarried gave a history of two or more previous abortions and therefore suffered more or less from chronic endometritis. Of the 201 cases saved, 149 gave no history of abortion or previous uterine disease. Of the women whose pregnancy was saved, 124 were primiparæ, 42 were pregnant for the second time. A healthy endometrium is a decided factor in the prognosis of threatened abortion.

In the first group (Cervix closed. Fœtus and decidua in utero. Hæmorrhage), 54 cases were listed. This condition was treated by a tampon in every instance. In three cases, it had to be repeated. In 12 cases, the ovum was found expelled when the tampon was removed and further local treatment abandoned. Manual removal of the oval mass was effected in 28 cases, while the curette finished the process fourteen times.

In the absence of hæmorrhage, records of twenty-nine cases are found. Packing was done only nine times. In twenty instances, the abortion proceeded spontaneously without local treatment. Of the nine tamponed cases, digital curettage was used five times, dressing forceps three times, and the curette twice.

In group three (Cervix dilated. Fœtus and decidua in utero. Hæmorrhage), eighty-six cases are reported. The finger curettage was used sixty-two times. In eight instances, the abortion became complete during preparations for operation. The De Lee forceps were used sixteen times. The curette was used under guidance of the finger in twenty-six cases to remove small fragments.

Sixteen cases were found coming under group 4 (Cervix dilated. Fœtus and decidua in utero. No hæmorrhage). The uterus was emptied with the finger in all cases. Twice it was subsequently packed for hæmorrhage. The curette was not used.

The largest number of inevitable abortion occurred under group 5 (Cervix closed. Fœtus expelled. Decidua in utero. Hæmorrhage). Here are numbered 184 cases. These were all packed. In twenty-four instances, the decidua were expelled spontaneously on top of the tampon. The cervix became sufficiently dilated to permit digital curettage in sixteen cases. The curette was used 141 times. The Hegar's sounds were mentioned six times in dilating the cervix, notwithstanding the fact that neither these sounds nor Goodell's dilator are found in the dispensary equipment.

Hæmorrhage was slight or absent in forty-two cases, mostly chronic abortion. These patients were all curetted and the contents removed.

Complete abortion was found fifty-one times. No local treatment was given, but the patient was placed on ergot and hydrastis.

Moles were found twelve times, three being hydatiform degeneration of the chorion. The remainder were blood moles.

Although these operations were performed by scores of internes, no history of perforation of the uterus is recorded. All the mothers recovered.

The following table regarding sepsis is reported:

Temperature F°.	Number of cases.	Percentage.
Normal	465	62.0
98.5° to 99.5°	174	23.2
99.5° to 100.5°	69	9.2
100.5° to 101.5°	24	3.2
101.5° to 102.5°	9	1.2
102.5° to 103.5°	3	.8
104.5° to 104.8°	6	.4

Ergot was administered only in the presence of sepsis or where the patient had lost considerable blood and the uterus appeared to be soft and relaxed.

Particular attention is called to the following points in the treatment of abortion:

1. The importance of treating all cases of uterine hæmorrhage accompanied by intermittent pelvic pain in a woman of childbearing age as acute abortion.

2. The value of absolute rest in bed in the treatment of threatened abortion until all pain and bleeding have ceased.

3. The necessity of saving as much blood as possible to avoid a long period of anæmia and prostration.

4. The selection of cotton pledgets in lieu of gauze strips as a material for vaginal tamponage.

5. The use of finger curettement and manual removal of the uterine contents *wherever possible.*

6. The performance of Hoening's abdomino-vaginal compression when the conditions are present.

7. The difficulty of complete sterilization of laminaria tents.

8. The danger of perforation of the uterus with steel dilators and sounds.

9. The great danger of uterine perforation with the steel curette in acute abortion and the value of the instrument in chronic abortion.

10. Curettement should be raised to the dignity and seriousness of a surgical operation and be performed under the same surroundings and with the necessary equipment.

11. The importance of refraining from curetting after the complete emptying of the uterus.

12. The use of ergot after the uterus is empty.

13. Local interference in septic abortion when the infection is limited to the uterine cavity. Less tendency to interfere when the adnexa or peritoneum are involved in the septic process.

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PLASTIC SURGERY OF THE ABDOMINAL WALL

BY ROBERT C. COFFEY, M. D., PORTLAND, OREGON

Abdominal hernia may be defined, in a general way, as a protrusion of the abdominal contents through the abdominal wall proper or beyond the ordinary plane of the abdominal wall. If the contents pass through an actual opening in the fascial wall (inguinal, femoral, umbilical, and post-operative or traumatic), the hernia may be said to be absolute. On the other hand, if a certain portion of the abdominal wall or fascia is weakened to such an extent as to allow protrusion of the contents of the abdomen without an actual opening in the fascial wall (diastasis recti), the hernia may be said to be relative. The principles for the treatment of absolute hernia are well established, while diastasis recti is well treated by Webster's method.

I wish to call attention to another form of relative hernia which occurs occasionally and is manifested by an increase in distance and a protrusion between the umbilicus and anterior superior spinous process of the ilium, due to transverse stretching of the fascia of the external oblique. This condition may be unilateral or bilateral, as shown in Figs. 1 and 2. When bilateral it may be classed under the head of pendulous belly, dwelt upon by Webster and others, but it is anatomically different in that it is external to the recti muscles. This condition is treated as follows: First, split the fascia of the external oblique parallel to the fibers in such a manner as to converge with a like split on the opposite side at a point just above the symphisis; secondly, separate the facia from the internal oblique; thirdly, draw one layer of the fascia under the other with quilt sutures of linen, taking care to have the loop of thread include the fibers of fascia in a transverse direction (Fig. 3, A); fourth, suture the remaining free edge of the fascia to the outer surface of the other layer with a continuous catgut suture to further improve the apposition at the free edge (Fig. 3, B). Thus the distance between the umbilicus and the anterior superior spinous process has been diminished, the protrusion has been reduced, and the fascial wall has been doubled. The result is an abdominal supporter made of the patient's own tissues, and it may therefore be termed an autoplastic bandage (Fig. 4, A). Two cases treated by this method, one unilateral and one bilateral, have been entirely successful. The one was performed eighteen months ago, and the other eight months ago.

EXPANSION OF THE UPPER PART OF THE ABDOMINAL CAVITY

When a patient has been afflicted with a chronic disease which has produced a gradual emaciation extending over a period of many months, and

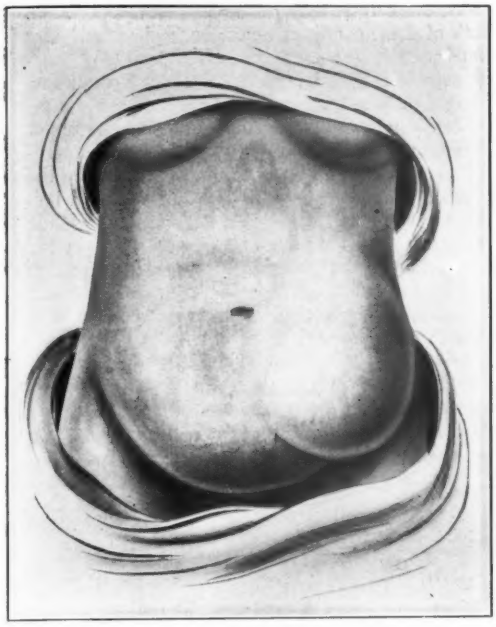

Fig. 1.

Fig. 3.

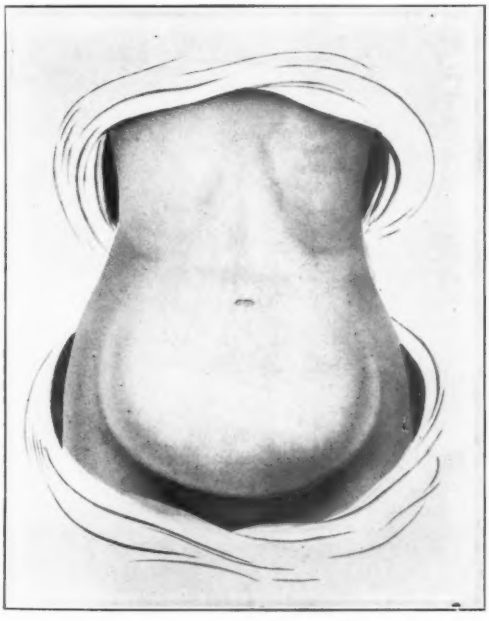

Fig. 2.

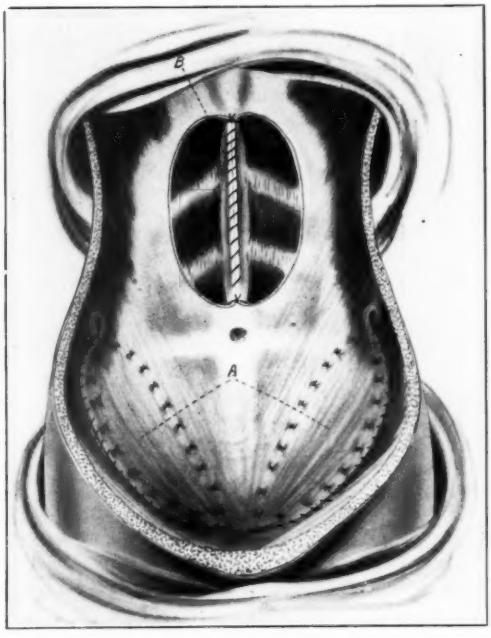

Fig. 4.

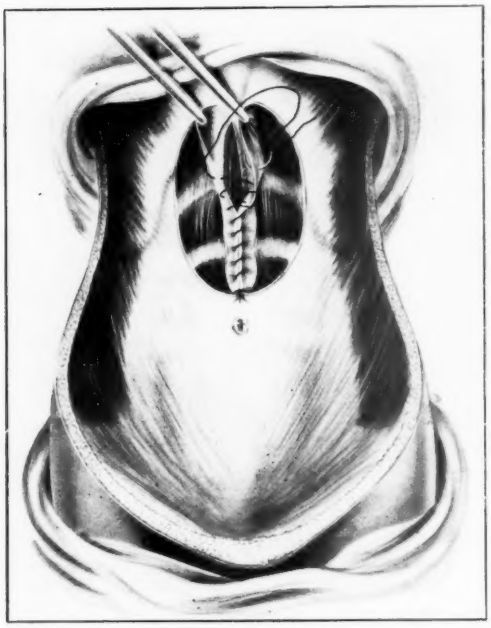

Fig. 5.

may be years, and especially if this disease be of such a nature as to deprive the organism of its normal amount of fluids, such as ulcer or cancer of the stomach, and particularly if the patient be a man who has previously been strong and heavy chested, the abdominal cavity becomes constricted very materially and the tissues of the abdominal wall become firm and leathery. The space between the recti muscles above the umbilicus is increased in an effort to compensate for this. Following an operation for stomach disease in such a case, it is often found very difficult and at times impossible to bring the edges of the wound into perfect apposition. Even if the wound is closed the tension may be so great as to be very uncomfortable for the patient.

In another class of cases in which a certain small per cent are surgical, a patient, who as a rule is a female, has a displaced stomach and liver and accompanying this condition an elongated chest wall which sometimes reaches almost down to the umbilicus. The writer has in some instances seen fit to shorten the ligaments of the liver and suture the omentum to the peritoneum of the abdominal wall. After these organs have been replaced in this manner it is found that the wound can not be closed without making undue pressure. This would tend to destroy the work of the operation. Both of these conditions have been observed more than once before a method of overcoming them by expansion of the upper abdominal wall was thought out.

After carefully studying the fascia of the upper abdominal wall we have put the following operation into practice, and I may state that where the possibility of such an operation is suspected it is well to bear it in mind when the incision is made so that the operator can make it directly in the line of the linea alba and thus avoid opening the sheath of either rectus. After the intra-abdominal operation is completed and the operator is ready to close, the expansion operation is completed as follows.

1. Split the anterior sheath of the recti muscles one inch or more from the median incision and dissect the fascia off the muscles toward the median line (Fig. 5). If the peritoneum is loose enough, it is well to suture it independently of the fascia,

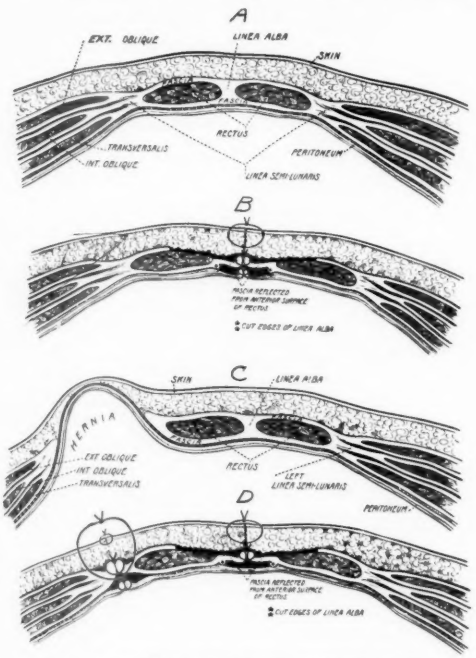

Fig. 6. Expansion of the upper abdomen by reflecting a portion of the anterior sheath of the recti muscles. A, Anatomy of normal abdominal wall. B, Scheme of plastic operation for expansion of upper abdomen. C, Sectional view of hernia following gall-bladder operation. D, Scheme of operation for closing hernia following gall-bladder operation, after expanding the abdomen by plastic operation in the median line.

then suture the reflected edges of the fascia together with strong catgut (Fig. 6, B).

2. The skin and fat may be closed with silkworm gut as indicated in Fig. 6, B (at times I have used a relaxation suture which has included the retracted edges of the sheaths in front of the recti). This parenthetical suggestion, however, is not essential and is not included in the pictures.

By this means the abdominal cavity can be expanded from two to three inches. I have done this operation in cases of ulcer and cancer of the stomach, five times and in cases of ptosis with contracted upper abdomen and correspondingly dilated lower abdomen in two instances, after replacing and anchoring the liver and stomach. In these cases the lower abdomen was narrowed as indicated in Fig. 4, A and B.

The results of these cases have been as perfect as could be expected. In no case has a hernia developed since operation nor has the skin become adherent to the muscle.

One of the principal indications which we have found for expansion of the upper abdomen has been for the repair of large herniæ following gall-bladder operations, such as indicated in Fig. 6, C. Such a hernia is sometimes very difficult to close, especially in fat patients. By expanding the abdomen in the median line the operation becomes simple. The operation in this instance differs from the one previously described in that the peritoneum is not opened. It is done as follows.

1. Make an incision through the skin and fat from the ensiform cartilage to near the umbilicus, and with a piece of gauze expose the fascia thoroughly for an inch or more on each side of the median line.

2. Make a corresponding incision of the fascia in the exact median line and thus avoid opening the sheath of the rectus. (The peritoneum is not opened.)

3. Split the anterior sheaths of the recti muscles an inch or more from the median incision and dissect off from the muscles toward the median line, (Fig. 5). Bring the edges of the fascial flaps together and suture in the median line, leaving the front surface of the recti muscles bare (Fig. 6, D).

With this amount of expansion it is possible to close with strong fascia any hernia which is found in this neighborhood. Occasionally it is very difficult to close a longitudinal incision of the right rectus even in a primary wound, in which instance the expansion operation just described would come in good place.

In this connection I will mention some experiments I have made on dogs, all of which are in accordance with the foregoing statements. In some

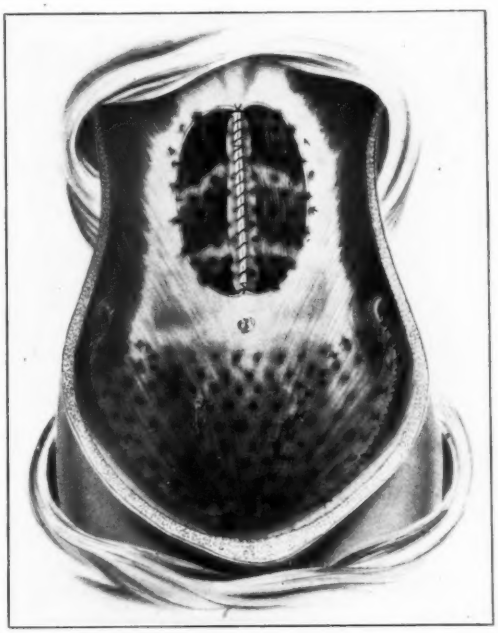

Fig. 7.

dogs I have supplemented the operations shown in Fig. 4 by darning the fascia and muscle as shown in Fig. 7. The darning was done with large linen thread, with the idea of making a stronger abdominal wall after the removal of the front part of the sheath of rectus. This experiment was entirely successful. The threads were completely imbedded in the tissues so that they were not discoverable to the naked eye on cross section. They gave no trouble in any case as far as coming away or suppuration was concerned. The skin did not become adherent to the sutures or to the muscles in any place. By palpation through the skin the indurated area surrounding each thread was easily felt. Where the muscle had been uncovered, as is shown in Fig. 4, dense new tissue had formed, resembling a new fascia, but as it was necessary to kill the dogs two months after experiment, it was impossible to determine whether a true fascia would form or not. I may say, however, that fibrous tissue resembling a new fascia bridged the space across the uncovered muscle perfectly where no darning threads were used. I would therefore, suggest that the darning across the gap is probably an unnecessary refinement in most cases, but that it may be well to know that it may be done with impunity in case it seems appropriate.

AN UNUSUAL CASE OF CONGENITAL MALFORMATIONS

By HERMAN L. KRETSCHMER, M. D.
Associate in Surgery, Rush Medical College, Chicago

For the privilege of reporting this very interesting and most unusual case of congenital anomalies, I am indebted to Dr. Louis E. Schmidt, to whose service the patient, a young man of twenty years, was admitted on February 7, 1909, seeking relief from a chronic urethritis of eighteen months' duration. The interesting features of this case are the congenital anomalies which the patient presents, so that they will be considered at once, there being no connection whatsoever between these conditions and his urethral trouble.

The patient states that he was born with the deformities just exactly as they appear to-day, with the exception that on his left lower extremity he had one toe that grew at a right angle to his leg. To all appearances it looked like the big toe. According to the patient's statement it was a perfectly normal toe, and it also had a nail. The patient does not remember whether he was able to move this toe or not. This toe interfered with the wearing of a wooden leg (peg) and on this account he had the toe removed fourteen years ago. This has been the only surgical procedure that the patient has undergone for his condition. Patient has had the usual diseases of childhood, otherwise he always has been in good health.

The family history in regard to the occurrence of similar congenital defects is negative. He has one brother living and well.

Examination. 1. The right upper extremity. The right arm and the right forearm are smaller than the left arm and forearm, and there is a complete absence of the right hand. At the end of the right upper extremity a good thick pad of soft tissue is present. No evidence of any previous operative interference can be seen. Pronation and supination, as well as flexion and extension of the forearm are perfectly normal. Measurements: the distance from the tip of the internal condyle of the humerus to the tip of the styloid process of the ulna measures 21 cm. as compared with 25 cm. on the left or normal forearm. The circumference of the right forearm measures 15 cm. around the styloid process of the ulna; the circumference of the forearm, 10 cm. above the tip of the styloid process of the ulna, is 15 cm. The left forearm measurements taken at the same places show 16 cm. and 20 cm. respectively. Lateral movements of the radius and ulna on each other are very free at the lower ends. Attention has already been drawn to the presence of a well-developed pad or cushion, such as is usually seen at the end of an amputation stump. The normal lines of the skin are well developed.

2. The left lower extremity. The left leg shows a stump covered with rather thick, firm, red, leathery skin. The end of the stump corresponds to about the junction of the middle and the lower thirds of the leg. The entire limb tapers down very fine so that he has a very long, thin stump, with the slightest kind of a cushion, which in appearance differs greatly from the usual amputation stump, as well as from the general appearance of the right arm. Just below the knee joint a circular deposit of pigment is to be noted, which is due to the pressure of the artificial leg that the patient wears. The patella is present, and as

Fig. 1. Lower end of the upper right extremity, showing complete absence of the right hand.

Fig. 2. Lower end of the left lower extremity, showing absence of the left foot and the rudimentary fibula.

far as can be determined by palpation, is perfectly normal. The head of the tibia is well developed; the tubercle of the tibia can easily be felt, and the crest of the tibia and its anterior surface present no deviations from the normal.

Upon palpating the outer aspect of the left leg, the presence of a small flat bone, freely movable and having no apparent connection with the tibia, is felt instead of the fibula.

This rudimentary bone is 7 cm. long and $4\frac{1}{2}$ cm. wide at its upper end and $6\frac{1}{2}$ cm. wide at the lower end, which measurements correspond with the findings upon palpation.

The right foot shows the presence of three toes. The great toe and the little toe appear to be perfectly normal. The patient is able to flex and extend these toes at will and with perfect ease. Between these toes a smaller one is present, and in contrast to his other toes, he cannot use this toe at all. Upon palpation the first and the fifth metatarsal bones can be felt. No metatarsal bone can be palpated corresponding to the middle toe that is present.

Five X-ray pictures were taken. Figure 1 represents the lower end of the right upper extremity, and shows a complete absence of the carpal bones, metacarpals, and the phalanges. The lower ends of both bones appear to be perfectly developed.

Figure 2 represents the lower end of the left lower extremity. It will be seen that there is a complete absence of the left foot. The left tibia is much smaller than the corresponding right tibia, otherwise it is well developed. The lower end shows the styloid process quite distinctly. Next we turn our attention to the fibula; instead of seeing a fibula that should in a general way correspond to the size of the tibia, a small, light shadow is seen in the upper half of the picture, which is all that is present of the fibula. The X-ray picture corresponds with the findings on palpation, as previously described. This shadow must be interpreted as a rudimentary fibula, the fibula for some reason or another having failed to develop. In order to show the relation of the rudimentary fibula to the knee joint, a picture of the knee joint was taken (Fig. 3) showing the

Fig. 3. Showing the distance from the top of the rudimentary fibula to the knee joint.

Fig. 4. "Spalt defect" of the left foot.

distance from the top of the rudimentary fibula to the knee joint.

Figure 4 represents the X-ray picture of his only foot, viz., the right foot. This picture shows the presence of the first and the fifth metatarsal bones and an absence of the second, third, and fourth. To all appearances, the first and fifth metatarsal bones present are normal. The picture also explains the patient's inability to use his middle toe.

The tarsal bones. The os calcis articulates directly with the outer metatarsal bone; due to an absence of the cuboid bone. The astragalus is present. The astragalus articulates with the scaphoid which in turn articulates directly with the first metatarsal bone, there being no external, middle, or internal cuneiform bones present. In his foot the four distal tarsal bones, viz., the cuboid and the three cuneiform bones, are absent.

SUMMARY

1. Complete absence of the right hand.
2. Complete absence of the left foot.
3. Presence of a rudimentary fibula.
4. Absence of four tarsal bones, viz., cuboid, internal, middle, and external cuneiform.
5. Absence of the second, third, and fourth metatarsal bones.
6. Absence of the second and fourth toes.
7. Presence of a middle toe which is without a corresponding metatarsal bone.

In this case, as in nearly all cases of congenital malformations, the patients generally attribute their defects to certain definite external factors. Thus, this patient attributes his malformations to two sudden frights to which his mother was exposed late in the pregnancy.

It may also be of interest to call attention to the fact that this boy was the second child; and in this connection it might be well to call attention to the figures of Peuch[1] who in a collection of 330 cases of anomalies found:

72 occurring with the second pregnancy.
90 occurring with the third pregnancy.
18 occurring with the fourth pregnancy.
12 occurring with the fifth pregnancy.
8 occurring with the sixth pregnancy.
5 occurring with the seventh pregnancy.
3 occurring with the ninth pregnancy.
1 occurring with the tenth pregnancy.
3 occurring with the eleventh pregnancy.
2 occurring with the twelfth pregnancy.
2 occurring with the fourteenth pregnancy.
2 occurring with the fifteenth pregnancy.

These lesions are due to some defect of development and not to amputations caused by amniotic bands, as can easily be determined by a study of the Roentgen pictures.

[1] Guerrini and Martinelli, Zeit. für Orthopedische Chirurgie, vol. vi.

SOME INJURIES OF THE ELBOW JOINT[1]

By JOHN E. OWENS, M. D., Chicago, Illinois

C. G., a switchman, fell from the top of a car and sustained a compound comminuted fracture of the right elbow. The inner condyle was separated from the shaft and comminuted. The outer condyle was also fractured, but no marked separation existed. The joint was open externally. The upper end of the ulna was intact. Resection of the elbow joint was performed. The olecranon process and lower end of the humerus were removed as well as the upper end of the radius in the proximal side of biceps tubercle. The cavity was filled with gauze and after the usual dressing, a light plaster of Paris cast was employed. This patient came under treatment in June, 1903, and was discharged August 11th. At the time of discharge there was a small opening the size of a pinhead. Flexion was better than a right angle and extension within twelve degrees of the normal. He has been performing his duties as a switchman and is still working.

T. L. received a crushing injury of the elbow joint. There were several punctures about the joint, fractures of the internal condyle, and comminuted fracture of the radius. The joint was resected. The pieces of the condyle, distal end of humerus, upper end of radius removed on the proximal side of the tubercle for the insection of the biceps were removed, and also the upper end of the ulna to include the articulating surfaces. The greater part of the wound was closed; the whole arm, in a flexed position, being enclosed in a light plaster of Paris cast.

The patient came under treatment August 30, 1907, and was discharged November 23d. He could put the ends of the fingers to the mouth, to the top of the head, and, in flexion, could bring the ends of the fingers within three or four inches of the top of the shoulder. Pronation and supination were somewhat diminished. A small sinus existed at the time of discharge.

M. C. W. was injured January 8, 1907. In this case a backward dislocation of radius and ulna at the elbow had been overlooked; fracture of both humeral condyles and the coronoid process. Arm had been dressed in the extended position; ankylosis in extension. Face, neck, left shoulder, and arm were scalded, second degree. Four years previously he received a gunshot wound of right biceps. He came under treatment in April, 1907. Prolonged attempts to reduce the dislocation under anæsthesia, failed. It was suggested that excision of the joint would probably result in a fair range of flexion, extension, pronation, and supination, the arm at this time being ankylosed in the straight position. Unfortunately the ulnar nerve was accidentally divided, but immediately sutured. June 6th the patient went home to remain several weeks. He wrote me that there was numbness of the little finger and on the adjoining side of the ring finger, and that he could not write satisfactorily. Motions of the fingers, however, were perfect. July 26, 1907, the surgeon reported as follows: Flexion and extension normal; no pain in joint or arm; pronation and supination restricted forty per cent; uses arm in any kind of light work; arm growing strong and more useful, although sensation in little and ulnar side of ring finger has not returned.

Under date of November 3, 1909, I received the following report from his physician: The patient has absolutely perfect use of elbow joint; some deformity of little finger, sensation of little and ring fingers, still absent.

C. S., a painter, fell from a ladder and was said to have dislocated both bones of the forearm backwards. He was taken to a neighboring town, and the arm dressed in the straight position. He was then transferred to his home, where another surgeon took charge of him. Taking the correctness of the first surgeon's opinion for granted, the plaster of Paris dressing was not removed for two or three weeks. The man came under treatment January 5, 1907. On the 10th an effort was made to reduce the dislocation but without success. The radius and both condyles were found fractured. Excision of the elbow joint was performed for irreducible dislocation and fracture of both condyles, January 29, 1907. The cavity was packed with gauze. He was discharged March 12th. The usual movements were present February 19, 1909, it was reported that the patient was working as a night watchman in a hotel, that the strength of the arm had increased, and that he was able to shovel coal into a furnace. In this case there was rather too much motion at the joint; more lateral motion than was anticipated (wabbling). A brace permitting the usual motions of the arm was devised and this remedied the defect referred to.

J. H., age 25 years, on March 25 1908, received a compound comminuted fracture of left forearm,

[1]Read before the Chicago Surgical Society, November 5, 1909. See discussion, page 101.

near the elbow joint, and a simple fracture of the eighth rib. The fractures were said to have been reduced. The patient came near dying from traumatic pneumonia which set in April 18th. It was thought, later on, that passive motion was all that was required. Finally the patient having been referred, examination and skiagraphs revealed fractures in upper fourth of radius and ulna, with considerable displacement and likewise a dislocation of the upper end of the radius upwards and forwards. Pronation and supination were abolished. Extension was dimished ten degrees. By using some force, the arm could be flexed to a right angle, but at that degree abruptly stopped; flexion was painful. Some interesting points were brought out concerning the difficulties in the reduction of a dislocated radius. The upper piece of the radius was joined to the upper piece of ulna by a bony bond of union. At this place the interosseous space was obliterated. Having first cut away the bony bond, just mentioned, between the radius and ulna, an effort to reduce the dislocated head by traction and pressure on the head of the bone proved unavailing. This upper piece was then grasped by lion-jaw forceps, the bone being somewhat protected, but direct traction on this, combined with flexion, extension, and pressure on the head also failed. The head of the bone was finally removed through an incision at the bend of the arm, when reduction of the dislocation became easy. The pieces were then drilled and wired. October 12, 1908, flexion and extension were nearly normal, pronation and supination considerably diminished. The patient left for Norway in December and there was just a perceptible flexibility at the seat of the broken bone. A small sinus also existed at this time.

A dislocation of the head of the radius is very often overlooked, particularly if the ulna be broken. I might state in this connection that a fracture in the upper quarter of the ulna is associated very frequently with a dislocation of the head of the radius forwards and upwards, as the direct violence which broke the ulna, unless it immediately stops, knocks the radius out of place. Indeed of late years, wherever I have encountered a fracture of the ulna in the locality named, I have looked for a dislocation of the head of the radius and have not usually been disappointed, and the reverse is also true that if a dislocation of the head of the radius forwards and upwards takes place, it is to be expected that a fracture of the upper fourth of the ulna has occurred.

On October 14, 1908, J. V. was standing about four hundred feet distant from a point where a boulder was being blasted; a piece of rock struck him on the left elbow, causing a compound fracture of the ulna within two inches of the joint. From a small opening in the soft parts, there was a continuous but not severe hæmorrhage. The wound was sufficiently enlarged to permit the entrance of the finger for examination. The injury was considered serious and the prognosis uncertain. Several fragments of bone were removed at the first dressing, the largest of these being an inch in length. Suppuration followed. On December 8, 1908, it was noted that motion of the elbow joint was limited, the latter being painful and enlarged. Immobilization of the arm was discontinued after the third week, but passive motion and massage substituted. February 21, 1909, it was discovered that there was no bony union, spongy portion of the fragment being necrotic, and the joint cavity opened. Firm ankylosis of the elbow took place with the arm in semiextension. Surgeon in charge removed the necrotic tissue and it was thought the wound would close in a short time. Fibrous union was broken down in order to flex the arm. Patient was discharged in April, but it was the opinion of the surgeon that he would not be able to perform the duties of a laboring man for several months. Arm could not be flexed to a right angle; pronation and supination fair; extension normal; wounds healed. Opportunity presented itself for an examination of this patient in February and it was found that in addition to other injuries there was a dislocation of the head of the radius upwards and forwards. Flexion could not be brought to a right angle, on account of the head of the radius abutting abruptly against the humerus and other tissues at the bend of the elbow.

A single straight incision at least four inches long, the middle being over the tip of the olecranon is usually sufficient for the excision. The incision should split the triceps and be carried to the ulna over the olecranon and upwards to a moderate degree over the humerus. The overlying structures including the triceps tendon must be peeled from the bone by elevator including the periosteum. Sometimes a thin, sharp chisel will be found useful. The line of section through the bone must be parallel to the condyle, and close above the articular surface so as to pass through the coronoid and olecranon fossæ. The line of section through the ulna and radius must include the lesser sigmoid of the ulna and the head of the radius preserving the insertion of the biceps muscle. After the operation, and the arm somewhat extended but without traction, the sawn surfaces should be one and one-half inches apart. This rule is by no means modern, but it is found to give the best results.

CONCLUSION

1. Such results are better than a tender and painful joint and also better than a stiff arm in any position, and better than one whose motions are decidedly limited.

2. That resection is also an economy of time.

3. That the varied and complicated injuries at and near the elbow joint render diagnosis in many cases extremely difficult.

4. Dislocation of the head of the radius is frequently overlooked especially if associated with a fracture in the upper fourth of the ulna, and such a dislocation should be expected where this fracture exists, and if the dislocation in question is present a fracture in the upper fourth of the ulna should be expected.

5. That a useful arm is to be expected if excision is properly performed.

6. That in any dislocation of the upper end of the radius and the ulna, a fracture of one or more of the bony constituents of the joint is to be looked for.

7. That errors in diagnosis are not confined exclusively to men of moderate experience, but the most experienced and successful cannot claim immunity.

BULLET EXTRACTED FROM HIP JOINT[1]

By EDWARD H. OCHSNER, M. D., Chicago, Illinois

This patient, male, thirty-six years of age, entered the Augustana Hospital April 12, 1908, with the history that on December 31, 1898, he was struck in the right groin by a stray bullet from a thirty-eight caliber revolver. The wound of entrance was on the inner aspect of the groin and there was no wound of exit. A doctor was called at the time, who probed for the bullet, but was unable to locate it. Apart from this probing, the wound was treated expectantly and healed kindly in about three weeks, but patient always noticed a little pain in hip, especially when in motion.

Three months after injury an X-ray showed the ball at the lower mesial junction of the femoral head and the acetabulum. At this time an incision was made in the groin, but bullet was not found. In May, 1907, about eight years after the injury and about one year before admission to the hospital, while lifting a heavy weight patient was taken with a severe pain in right hip. Directly following this he was unable to walk or move joint without excruciating pain. After several days rest to the joint the pain ceased. In July, 1907, another X-ray picture showed the ball in apparently the same position as located by the first X-ray three months after the injury. A third attempt was now made to find the bullet by making an incision over posterior surface of upper end of thigh, but this again failed. One week later a fourth attempt was made by making an incision over anterior surface of thigh, which again failed.

After leaving the hospital this time, pain continued and on several occasions, especially after sudden lifting or on assuming unusual attitudes he had excruciating pain in hip, which was accompanied by inability to move the joint in any direction.

When admitted to the Augustana Hospital, April 12, 1908, the patient's general condition was good. Right hip and right thigh showed several scars, as detailed above, extreme abduction, extension and flexion impossible. On taking a stereopticon radiogram we found the shadow about the middle of the neck of the femur, but were unable to decide positively whether the bullet was anterior or posterior to the bone, though it was clearly not located in the bone itself.

The patient was anæsthetized April 13, 1908, a vertical incision, twenty centimeters long directly over the right hip joint was made through the skin, fascia, and muscle down to the capsule of the hip joint. These tissues were now retracted, the capsule of the joint opened, the anterior surface of the neck of the femur examined, but no bullet was found. I now took a one-half inch gouge and chiseled a hole directly through the center of the neck of the femur and with an artery forceps extracted the bullet through this opening. The bullet was located just behind the middle of the neck of the femur between the bone and the capsule of the joint. The wound was now closed, leaving only a small cigarette drain. A plaster of Paris spica extending from the umbilicus to the right knee applied over cotton with the thigh at slight ventroflexion, abduction, and inward rotation. Four days later drain removed. Thirteen

[1] Case reported November 5, 1909, at meeting of Chicago Surgical Society. See discussion, page 101.

UofM

days after operation stitches removed, wound found completely healed. Seventeen days after operation a new plaster of Paris cast applied over stockinette. Patient allowed to go home on crutches May 3d. Second cast removed June 11th, when motion of hip was about as at present. Patient walked very satisfactorily and went back to work, but on July 15th he fell and sprained his right hip, which caused some pain and anxiety, so that on August 1st I applied a new plaster of Paris spica, which was worn for several months. The patient has been at his work ever since, has experienced no discomfort, is rid of the pain and the symptoms of locking, and with motion nearly perfect in every direction he now has a useful hip joint.

I have taken the liberty of presenting this patient and his history to the fellows of this Society, because I believe it certainly is an unusual case.

Dr. Finney and I have looked over the literature with some care and while we are able to find a considerable number of cases of gunshot wounds of the hip joint reported, most of these cases were complicated with fracture of one or both of the bones entering into the formation of this joint. In the History of the War of the Rebellion[1] we find a memorandum of forty-nine cases of shot wounds, which the reporters believed led to the opening of the coxa femoral articulation without direct injury to the bone, but we are unable to find any mention that any bullet was actually found free within the joint capsule.

A probable diagnosis of bullet in the joint was made on the history of locking of the joint and on the fact that the skiagrams showed the bullet in different locations at different periods. It did not seem possible that so large a bullet could travel such a distance unless it were within the capsule.

In this connection I would again like to call attention to the importance of absolute immobilization during the healing of a joint injury. I believe that in such cases fair motion will be obtained in a very much larger percentage of cases by securing absolute immobilization than by resorting to the often recommended early active and passive motion.

[1] History of the War of the Rebellion, vol. iii, p. 25.

TRANSACTIONS OF SOCIETIES

CHICAGO SURGICAL SOCIETY

A REGULAR MEETING WAS HELD NOVEMBER 5, 1909, WITH THE PRESIDENT, DR. ARTHUR DEAN BEVAN, IN THE CHAIR

Dr. A. E. Halstead presented a case of pulsating exophthalmos. (See page 55.)

"A Foreign Body in Hip Joint, with Exhibition of Case," was the subject of a presentation by Dr. E. H. Ochsner. (See page 99.)

DISCUSSION

DR. JOHN E. OWENS: Mr. President, a few years ago I had a case somewhat like that reported by Dr. Ochsner, except that the bullet went in on the outer aspect, as far as I remember, just below the anterior superior spine. The bullet lodged in the upper portion of the neck, along the outer segment of the circumference of the head of the bone. The bullet was removed with considerable trouble, but I regret to say that, having lost sight of the patient a report on the condition of the joint cannot be given.

Dr. John E. Owens presented a paper on "Some Injuries of the Elbow Joint." (See page 97.)

DISCUSSION

DR. D. N. EISENDRATH: There is one point which Dr. Owens has referred to that I believe is generally overlooked in these fractures close to the elbow joint, and that is the frequency with which these injuries are accompanied by severing or contusion of the nerve trunks of the radial, ulnar, and median nerves. In a great many cases the median and ulnar nerves are not severed, but are stretched across the end of the upper fragment in such a way as to produce symptoms similar to the actual severing of the nerve.

I saw recently, within the last week, a case of undetected musculospiral paralysis following one of these comminuted fractures close to the elbow joint. It was a case where a doctor was being sued for malpractice on account of this injury to the musculospiral nerve following a comminuted fracture, and no effort was made at the time of setting the injury to avoid nerve injury, and no information given the family that such a thing had occurred, and no complaint made afterwards. I believe we are apt to think that nerve injuries can occur chiefly in the middle shaft, and overlook the fact that they are not so very rare at the lower end.

There is another point with relation to nerve injuries at this portion of the humerus that I think is apt to lead us astray, and that is the fact that so very frequently we get no anæsthesia. That is to be explained, so the neurologists tell us, by the vicarious action of the associated or neighboring sensory nerves, which rapidly take the tactical sense action of the nerve injured. One cannot depend on that symptom alone.

There is one point that has been brought out, that cannot be too strongly emphasized, and that is the necessity, so far as possible, of taking exercise for the elbow joint injuries, because in many cases the injuries are overlooked. The case is treated for week after week as a simple sprain of the elbow joint, and then suddenly, when the patient recovers from the immediate effect of the swelling, the thought comes that there might have been a fracture of the neck or head of the radius.

Dr. S. C. PLUMMER: Mr. President, I would like to speak of a typical case of excision of the elbow joint, where the functional result quite surpassed my expectation. This man was a switchman, who slipped and fell with his arm across the rail, and he said the car ran over his arm at the elbow. I do not believe this account of the injury, but rather that the car ran over the point of the elbow. His injury was a compound, comminuted fracture of the lower end of the humerus, leaving the forearm bones in contact, however. The muscles at the lower end of the humerus were all pulpified, fragments of bone hanging by shreds of muscles and portions of ligament. The ulnar nerve was entirely exposed for about four inches, standing out as if it had been dissected. The loose pieces of bone were removed, and the humerus sawed off. The ulnar nerve I covered with fascia, and there were never any symptoms at all from the ulnar nerve. This man got a wonderfully good functional result, so good that he pleaded to be reinstated as a switchman. He was not allowed to do such dangerous work, but he is doing actual

railroad work now. The muscles draw up the bones against the end of the humerus, and he gets quite a fulcrum there. The strength of the muscles of the elbow joint was surprising.

THE PRESIDENT: About six years ago, at the Surgical Section of the American Medical Association, at Atlantic City, I reported four or five cases of elbow joint injuries, limited, however, to dislocations, which the X-ray showed in every instance to be complicated with fracture. I operated upon all of those cases and found this, that on exposing the joint and removing the fragment of bone which locked the dislocation, and prevented reduction, that if this was done early, within two or three months, that the joint recovered its function; that in the really ancient cases in which the dislocation had existed for a number of months, or a year or more, even though the reduction was obtained, in spite of passive motion and breaking up the adhesions under an anæsthetic, we obtained a stiff joint. In two cases, instead of making a reduction I made a resection of the lower end of the humerus, and we obtained a very good functional result.

I believe that my experience confirms that of Dr. Owens. I am rather inclined to think I would advocate in these old dislocations where any attempted reduction was made, simple reduction in the very recent cases only, as one cannot be sure of obtaining a good functional result in the very old cases.

Dr. Daniel N. Eisendrath read a paper entitled "Ileus Due to Meckel's Diverticulum."

DISCUSSION

DR. HARSHA: I would like to ask the doctor if a vaginal examination was made in this case.

DR. EISENDRATH: Yes.

DR. HARSHA: In a case which I reported to this Society three or four years ago a vaginal examination showed a distinct tenseness that would lead one to suspect a distended gut. The form of that was different, in that the direction was directly downward from the ileum, and the terminal ligament only two and a half or three inches long, reaching directly over the ileum, and attached to the mesentery of the ileum. In that case there had been two or three abdominal crises that had passed off without any serious consequences, and had not produced complete obstruction. When she was operated the bowels had been obstructed almost completely for four days, with intestinal vomiting. I believe the differences in the symptoms in partial or complete obstruction are mainly the appearance of the patient, showing more or less profound disturbance, and the range of temperature, the temperature remaining subnormal longer in partial than in complete obstruction owing to the delay in intraabdominal infection.

I think a rectal examination in these cases gives one an idea of the intestinal distention which would help differentiate it from appendicitis or other inflammatory conditions.

DR. L. L. MCARTHUR: Mr. President, as illustrating the difficulties of diagnosis of ileus provoked by Meckel's diverticulum, I recall a case seen in conjunction with Dr. Billings, of this city, in which he held up firmly to the diagnosis of appendicitis, I to intestinal obstruction by band. The case became so desperate that operative interference was required. My inclination to fortify my diagnosis led me to sweep my hand underneath the umbilicus immediately on opening the abdomen, and the band was found. The band had caught the appendix close to the caput coli, cut through it and permitted a leakage, with septic ileus as a cause of the intestinal obstruction.

The second case came under my observation last year, of a young girl eleven years of age brought to me for acute septic appendicitis, with a distinct tumor to be felt through the rectum. Before opening the abdomen there were symptoms corresponding to appendicitis, fever and rapid pulse, high blood count, and ileus attending same. I first found that the appendix was perfectly normal, and following the ileum along a distance of eighteen or more inches from the ileocæcal valve I came upon a Meckel's diverticulum of the largest size that it has been my opportunity to view, one much larger and longer than my thumb, without a mesentery, and without a band at its terminal, free end. This seemed to be perfectly normal, and being even larger than the caliber of the bowel, I let it alone. Searching further I found that the ileus was due to a commencing gangrene in a twisted dermoid cyst, prolapsed in the pelvis.

The third case presented a typical history of appendicitis, but was found to be a diverticulitis, with gangrene in the diverticulum simulating appendicitis, which required simply the removal of the gangrenous portion of the bowel to effect a cure.

DR. A. J. OCHSNER: Regarding the diagnosis in cases of intestinal obstruction, unless one has a definite reason for supposing the obstruction to be caused by some condition on the left side of the abdominal cavity, I believe the rule Dr. Eisendrath laid down is not good, because about eighty per cent of obstructions come from conditions in the right side. In some instances the condition may seem to be due to a mechanical obstruction, and

still be due to a perforated gall-bladder or duodenum, or even a perforation of an ulcer in the pylorus just at the duodenal end, or it may be due to intussusception. The condition may be due to inflammation of the appendix, Meckel's diverticulum, perforation of a typhoid ulcer, perforation of the duodenum, gall-bladder, and pyloric ulcer. All these conditions I have seen in cases which were diagnosed as intestinal obstruction, and all these cases could be best discovered through an incision splitting the right rectus abdominis muscle.

Then, as regards the finding of the diverticulum, I have operated on eight cases, and I have made a diagnosis in each case after the abdomen was opened. Before the operation diagnosis varied between all of the above conditions. If one follows the rule that Dr. McArthur has mentioned, to reach up under the umbilicus in order to determine whether there is a band, then beginning at the cæcum, and following the mesentery of the ileum upward and to the left one finds the obstruction in almost every case. You do not have to manipulate the intestine.

In those cases in which there is a great deal of distention above the obstruction, we have repeatedly of late applied Moynihan's glass tube, making a longitudinal opening in the intestine, and inserting a long glass tube, and allowing the liquid fæces to run out. If one tries to shove the tube up into the intestine one fails regularly, and that is why Munks announced that it was impossible to use a glass tube in emptying the intestines. Then Moynihan showed that by folding up the intestines on a glass tube as one draws a glove over a finger, it is very easy.

In the last case we irrigated the intestine, which looked so blue that conditions seemed hopeless. I introduced a little warm normal salt solution through the glass tube, and immediately the intestine began to have a better color. By the time we had filled and emptied it two or three times the color was very fair.

DR. A. E. HALSTEAD: Mr. President, I have been struck regarding the statistics of Meckel's diverticulum. It is well known that they are found at autopsy in 2¼ to 3 per cent of all cases. Statistics also go to show that nearly 5 per cent of all obstructions occur from Meckel's diverticulum. I have seen only three altogether, one that produced obstruction, one perforated with typhoid fever, and one found accidentally, that did not cause any symptoms. I have talked to a number of surgeons about this point, and their experience has been about the same as mine, that comparatively few cases are seen in the course of operative experience.

DR. EISENDRATH (closing the discussion): In a talk this afternoon Dr. Halstead told me of a case of Meckel's diverticulum he had seen.

There is very little I have to add. I am glad to hear that the experience of the gentlemen who have seen these cases is pretty much the same as my own. The majority of these cases are not recognized before operation.

I think Dr. McArthur's suggestion is an excellent one, in regard to palpating the internal wall of the abdomen in order to determine whether there is a diverticulum.

I have had no experience with the Moynihan method, as mentioned by Dr. Ochsner, but I can speak from personal experience with regard to the value of enterostomy. I have had three cases of intussusception in children. Two of them I lost through trying to do a resection. The children were not in any condition to stand resection. The third one was in just the same kind of condition. I did at first an enterostomy, and later on a resection. I believe either enterostomy or cæcostomy in these cases is indicated if we cannot do anything more radical.

The great thing of interest in regard to these cases of Meckel's diverticulum is the various forms in which the ileus may occur. Up to the time I had had this case I really thought there was one form, but upon studying the subject I found it was particularly complicated.

Dr. Dean D. Lewis submitted a paper on "Multilocular Cysts of the Jaw." (See page 28.)

DISCUSSION

THE PRESIDENT: I have seen four or five of these odontomas, and I think they are exceedingly interesting tumors, because it is well known that so many of them have been handled as malignant tumors. I am rather inclined to think that the best short description in English is found in Bland-Sutton's book on tumors. My own experience has been rather varied. All the tumors have been of different types. At one time we had three odontomas at the winter session at the college. One was a single little tumor which grew from the lower border of the inferior maxilla. It was a tooth bud which had evidently turned downward, and had grown along the bone, and projected as a tumor-like mass at the lower border of the inferior maxilla. It was regarded as an osteoma. At the time of the examination it was found to consist of irregular, rather curly shaped enamel which projected from the bone. A second one was the one Dr. Lewis has reported, and my opinion at the time was that it was a malignant growth. I was surprised when she returned three years after

the operation, as I supposed it had been one of those fatal cases of malignant disease. At the time of the second operation we made a radical operation, and established definitely the diagnosis. The third case, which I remember fairly well in detail, was a case in which the cyst-like cavities were filled in with watery fluid, rather a gelatinous substance, and this interesting problem presented itself, whether to resect the lower jaw, or make a conservative operation. I decided on the latter plan, and I found it was possible to do this, and to remove the tumor very thoroughly, with the exception of some portions of several cysts which involved the jaw, which had to be left in order to save a sufficient mass of bone to make a support of the inferior maxilla and the teeth. I did not hesitate to leave those portions of the bone, and curette out the cyst cavities which invaded the bone, touching the surface with carbolic acid. The woman made a very good recovery, with practically no deformity at all, as the incision was well under the line of the jaw. It is now several years since the operation, and I am not in a position to report her present condition, but some months after the operation the condition seemed very favorable.

Another case which I remember was one which seemed to be one of those multilocular cysts which was situated so that the inferior maxilla was expanded around it as a great mass of bone, and was about the size of the fist. A fifth case I have seen recently, in a boy about twelve years of age, the history being that the boy has had the tumor for the last seven or eight years. I was interested in the case because the physician was quite impressed with the fact that it was a malignant sarcoma, and should be removed. I was rather impressed with the fact that it was an odontoma, and that a conservative operation would succeed in curing the case.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF SURGERY

UNDER THE CHARGE OF

JOHN B. MURPHY, M. D.
FREDERIC A. BESLEY, M. D.
WM. C. DANFORTH, M. D.
AIMÉ PAUL HEINECK, M. D.
FRED C. ZAPFFE, M. D.
WM. R. CUBBINS, M. D.
ARTHUR B. EUSTACE, M. D.
FREDERICK G. DYAS, M. D.
M. G. SEELIG, M. D.
GEO. E. BEILBY, M. D.

Benign Tumors, Fibroma, Myoma and Lipoma Encapsulated in the Wall of the Stomach. W. G. SPENCER. *Proceedings of the Royal Society of Medicine*, 1909, ii, 311.

This article collects from the literature all the benign tumors of the stomach reported. Spencer remarks that although sarcomas are more common, benign tumors do occur, and when present can be readily shelled out from the lining of the stomach.

C. G. GRULEE.

Foreign Bodies in the Upper Air and Digestive Tracts, with Special Reference to Oesophagotomy (Fremd körper in der oberen Luft. und Speiswegen mit besonderer Berücksichtigung der Oesophagotomie). MARSCHIK. Wiener Klinische Wochenschrift, 1909, xxii, 1405.

After report of 3 cases of foreign body in the larynx the writer takes up the main subject, i. e., foreign bodies in the œsophagus. He reports 11 cases of œsophagotomy for foreign bodies, two of which died, one of pneumonia and one of a putrid empyema following puncture of the pleura during the operation.

A great deal of emphasis is put upon the X-ray as a means of diagnosis. After careful history and X-ray examination the œsophagoscope is tried in recent cases where the bodies are round and smooth. With sharp bodies, and especially in those cases where the foreign body has been present a long time œsophagotomy is resorted to. The potato treatment is recommended as an early measure. C. G. GRULEE.

Surgical Treatment of Pulmonary Abscess (Traitement chirurgical de l'abcès du poumon). A. GUIBOURG. Thèse, Paris, 1908.

These are the steps of the operation such as it must be actually practiced:

1. Chloroform anæsthesia. 2. Curvilinear incision, with convexity downward corresponding to the inferior limit of the abscess. 3. Resection of an ample number of ribs, depending upon the seat and the volume of the abscess. 4. Exploratory pleurotomy. In the absence of adhesions, the two layers of pleura must be sutured together. 5. Localization of the pus-collection by the aid of exploratory punctures. 6. The needle being left in place, the lung is opened either with a knife or with a thermocautery, depending upon the state of the pulmonary tissue, or with the index finger. 7. Abscess cavity is closed with tampons impregnated with an antiseptic solution. 8. Rubber drainage tubes are used.

The same author reports a case in which he easily found an abscess the size of a walnut situated four centimeters from the surface of the lung. Two layers of the pleural wall were adherent. The abscess was incised with the thermocautery. Recovery ensued.

Schiassi, to remove a nail impacted in a bronchus resected portions of the fifth, sixth, seventh, and eighth ribs posteriorly; he detached the pleura, exposed the bronchus, and removed the nail. The wound was packed; an extensive subcutaneous emphysema lasting two days was the only incident marring recovery.

AIMÉ PAUL HEINECK.

The Pathological Relationships of Gastric Ulcer and Gastric Carcinoma. LOUIS BLANCHARD WILSON AND WM. CARPENTER MAC CARTY, M. D. *American Journal of Medical Sciences*, Vol. 138, No. 6, 846.

The authors' work is based upon the study of specimens from gastric and duodenal resections and excisions for ulcer and carcinoma by Drs. W. J. and C. H. Mayo, from January 1, 1905, to April 1, 1909. The total amount of material studied comprised specimens from 218 cases. Eight of these were from the duodenum, and were all simple ulcers. The remaining 210 were from the stomach. Of these, 47 were ulcers without suspicion of carcinoma; 2 were sarcomas, 2 adenomas, and 1 a diverticulum.

Of the remaining 158 cases from the stomach, 5 were ulcers with enough microscopic appearance of aberrant epithelial proliferation to place them in the doubtful class as possible transition cases.

Of the remaining 153 cases which were undoubted carcinoma, 109 (71 per cent) presented sufficient gross and microscopic evidence of previous ulcer to warrant placing them in a group labelled "carcinoma developing on preceding ulcer." Eleven other cases (7 per cent) showed evidence of precedent ulcer," but not sufficient to warrant placing them in the previous group. In 33 cases (22 per cent) there was

relatively small or no pathological evidence of precedent ulcer.

The authors conclude as follows: "That carcinomas should develop in the edges of gastric ulcers is only what we should expect; the wonder is that the facts should have been so long in being recognized. This has been due to (*a*) failure to recognize clinically the frequency of gastric ulcer; (*b*) failure to recognize that gastric cancers are not initially pyloric tumors, but extensions thereto from the lesser curvature; and (*c*) giving undue weight to observations at autopsies. When the patient has died of cancer the neoplasm has usually obliterated all gross and microscopic evidence of previous ulcer.

As the pathologist examines stomach specimens from the surgical clinic he constantly observes the following steps in the following sequence:

1. Chronic ulcers from the centers of which the mucosa has disappeared leaving a scar tissue base.
2. In the overhanging borders of the ulcers the mucosa is proliferating.
3. Deep in the borders many groups of epithelial cells have been nipped off by scar tissue and are exhibiting all stages of aberrant proliferation with infiltration of the surrounding tissues.
4. Metastases are forming in the lymphatics of the stomach wall and adnexa.

Adopting Adami's classification we may therefore correctly designate most gastric carcinomas as "blastomas originating from unpotential cells of postnatal displacement," although it is probable that a very small number are "blastomas originating from unpotential cells that assume neoplastic characters without displacement and rapidly assume malignancy."

ARTHUR B. EUSTACE.

Diseases of the Oesophagus (Ueber Erkrankungen der Speiseröhre). KAUFMANN AND KIENBOCK. *Wiener Klinische Wochenschrift*, 1909, xxii, 1199, 1235, 1268, 1303.

This comprehensive article or rather series of articles, takes up very completely diverticula and dilatations of the œsophagus. Only the important points will be taken up in this abstract. For one who is especially interested in the subject the original should be consulted.

The authors first consider the "high seated traction diverticulum." A thorough review of the literature is followed by report of five cases. It was impossible to fill the diverticulum with bismuth solution because on deglutition some of the solution was expelled. Examination with the X-ray led to a diagnosis much earlier than other methods. They next discuss the "deep seated traction diverticulum with cardiospasm." After a review of the literature two cases are reported. In the first case they regard the cardiospasm alone as the cause of the disturbance of deglutition. The cardiospasm is often due to irritation of the œsophageal mucuos membrane found in the diverticulum.

The third variety is the "deep reaching diverticulum with cardiospasm" in which the opening of the diverticulum is high up and the sac extends downward. This variety is discussed much as the former ones, one case only being reported.

The next variety, the "idiopathic dilatation of the œsophagus," is discussed at length. The writers tend strongly to the opinion that in a number of cases the dilatation is due to flaccidity of the œsophageal wall as the result of impairment of the function of the vagus nerve. To stimulate the vagus, atropin was used with quite marked success, especially in the last of the five cases reported. A case which is primarily due to a disturbance of the vagus function may eventually show changes in the mucous membrane and not respond to treatment.

C. G. GRULEE.

Wounds of the Vertebral Artery (Les plaies de l'art ère vertébrale). P. BOUCOUT. Thèse, Paris, 1908. *Archives générales de Chirurgie*, May, 1909.

Of all wounds of the vertebral artery, stab wounds are the most frequent. Hæmorrhage, quite abundant, but easily controlled attends the injury. The initial wound closes. Three weeks after the traumatism an aneurism appears. The rupture of this aneurism most always means death, either by (1) entailing secondary infectious complications; (2) or in the majority of cases, by hæmorrhages (*a*) which are relatively abundant (*b*) every time arrested (*c*) which recur easily (*d*) which owing to their repetition, weaken the patient. Death takes place in from three weeks to six months after the traumatism. Cure is a rare occurrence. In fifty-two cases, there were four recoveries.

Most always, aneurisms of the vertebral artery have been mistaken for aneurisms of the carotid. However, Chassaignac has shown that a precise diagnosis is possible. In wounds of the common carotid or of one of its terminal branches, compression of the vessel practiecd above or below the tubercle of the sixth cervical vertebra stops the hæmorrhage. Hæmorrhage from a wounded vertebral artery is influenced by compression made below and not above the tubercle. In cases of doubt, one is justified in placing a temporary ligature on the carotid. If the hæmorrhage continues after ligation of the common carotid artery, the wounded vessel is the vertebral artery.

Packing it must be rejected because it fails to prevent the recurrence of the hæmorrhage. Furthermore, packing is very painful, and favors infection. Ligation of the bleeding vessel is the only satisfactory method of treatment.

AIMÉ PAUL HEINECK.

Treatment of Goiter with the Röntgen-ray (Zur Behandlung des Kropfes mit Röntgenstrahlen.) v. EISELSBERG. *Wien. klin. Wchnschr.*, 1909, xxii, 1585.

v. Eiselsberg has operated upon three cases of goiter which some years previously had been treated with the X-ray. In all of these the only change found was a much greater difficulty in separating the muscles from the anterior surface of the tumor. v. Eiselsberg has never seen any permanent benefit from the use of X-ray in the treatment of goiter of any form, and does not employ it in his cases.

C. G. GRULEE.

The Surgery of the Thymus Gland (Chirurgie du thymus). V. VEAU. *Bulletin Societé de Pédiatrie*, 1909, p. 129.

The author has collected seven observations of ablation of the thymus. They are as follows: Rehn, cure; Koenig, cure; Purrucker, cure; Ehrhardt, cure; Rehn, cure; Koenig, improvement; Hinrichs, cure. The operative technique is simple. Longitudinal cervical incision extending from the thyroid to the sternum. Incision of the deep cervical fossa, opening of the capsule of the thymus. During expiration, the gland ascends; this facilitates its enucleation. This enucleation should be done without handling of the capsule which usually adhers to important organs: veins, pericardium, and nerves. The vessels of the thymus enter its superior pole. They are branches of the internal mammary and of the middle thyroid. They should be ligated. AIMÉ PAUL HEINECK.

Central Dislocation of the Femur with Fracture of the Acetabulum. A. E. HALSTEAD. *New York Medical Journal*, 1909, 953.

Halstead speaks of some fifty cases of this condition being on record and reports a new case. In taking up the general discussion of the subject he regards the X-ray as a very great aid in the diagnosis. The treatment must depend upon complications and as to whether the head of the femur is loose or held firmly by the acetabulum. C. G. GRULEE.

Congenital Position Anomalies of the Appendix and Congenital Predisposition to Appendicitis (Ueber angeborene Legeanomalien des Wurmfortsatzes und angeborene Disposition für Appendizitis). HEINRICH ALBRECHT. *Wein. Klin. Wchnschr.*, 1909, xxii, 1359.

Albrecht found anomalous position of the appendix in fifteen per cent of about 500 autopsies held on children under six years of age. Among the positions assumed by the appendix were practically all those regarded as pathological except the retroperitoneal variety, of which not a single case was found. The appendix was frequently found attached to the adjacent structures by peritoneal bands. All cases of possible peritonitis were excluded.

Albrecht thinks that these are congenital anomalies and expresses the opinion that at operation one of these forms of appendix malposition is frequently mistaken for a chronic appendicitis with adhesions.
C. G. GRULEE.

Post-traumatic Vertebral Deformities (Déformations vertébrales post-traumatiques. Maladie de Kümmell). GRISOL. *Revue d'Orthopédie*, 1907, No. 2.

Since the work of Kummell it is known that after injuries to the spinal column deformities analogous to those of Potts' disease not uncommonly occur. The author examined a child six years of age who, as a result of hyperextension of the trunk, showed a prominence in the lumbar region with projection of the spinous process of the third lumbar vertebra. The lesion became worse in time. The X-ray showed the presence of lateral compression of the lumbar vertebra with fracture of the vertebral pedicle and of the right superior articular process.

What is the etiology of these post-traumatic vertebral deformities? For Kummell, trauma determines nutritive disturbances of the vertebra which atrophies through a compressive ulceration. Mickulicz says that the extra- and intradural hematoma infiltrates the nervous ganglia and thus determine strophic disturbances of the spongiosa of the vertebra.

The diagnosis is always difficult. Chief among the conditions to be excluded are tuberculous spondylites, chronic rheumatism, and traumatic hysteria.
AIME PAUL HEINECK.

Vertebral Diastasis (Le Diastasis Vertébral). BERTEIN AND WORMS. *Revue de Chirurgie*, 1908.

By vertebral diastasis is understood a lesion of the spinal column characterized by separation of the vertebræ with rupture, complete or nearly complete, of the ligaments. Articular displacements are absent. Owing to the almost constant presence of medullary disturbances, the condition is frequently fatal. The diastasis usually determined by forced flexion and rotation of the vertebra affects generally the fifth and sixth cervical vertebræ. There is a notable separation of the articular surfaces. The ligaments, especially the posterior ligaments, are lacerated. The spinal cord is ecchymotic, may present true apoplectic foci. The torn meninges allow the slow infiltration of blood. Hematorachis results thereform. The medullary lesions are due to elongation. Clinically, one observes paraplegia with anæsthesia and abolition of the reflexes, then respiratory and thermic disturbances in relation with the seat of the lesion. Local examination is negative. The movements of the neck are preserved. The spinous processes are not displaced. These two symptoms allow one to differentiate diastasis from fracture and from dislocation of the vertebræ.
AIMÉ PAUL HEINECK.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF GYNECOLOGY

UNDER THE CHARGE OF

J. CLARENCE WEBSTER, M. D.
J. C. HOLLISTER, M. D.
GERRY R. HOLDEN, M. D.
E. C. DUDLEY, M. D.
GEO. DE TARNOWSKY, M. D.
CAREY CULBERTSON, M. D.

The Causes and Prevention of Failures in Operative Gynecology. DR. L. M. BOSSI. *La Gynecologia Moderna*, May, 1909.

Bossi attributes gynecological failures principally to (1) co-existing lesions or diseases of other than pelvic organs. (2) Dangers of chloroform narcosis, usually due to incompetent anæsthetizers. Personally, in a series of about 14,000 anæsthesias, he has never had a death due to narcosis. (3) Primary or secondary hæmorrhage. (4) Shock. (5) Deficient powers of resistance on the part of the patient. (6) Infection. He sums up the prevention of these failures as follows:

1. Avoid daring operations, unless indications are imperative and results are apt to be life saving.

2. Never have the anæsthetizer or the patient's head hidden from the surgeon's view by sheets or partitions. The surgeon should not lose sight of the anæsthetic. Operate rapidly in order to minimize the amount of chloroform used.

3. Whenever possible ligate blood-vessels before cutting tissues, or ligate tissues enmasse. Bossi cuts tissues ¾ cm. from the ligature in order to avoid slipping of same.

4. In order to lessen the danger of shock, make small incisions, avoid useless handling of viscera, operate as much as possible extra-abdominally by drawing out the tumor or organ to be operated on, meanwhile protecting the other viscera by means of pads.

Perfect a simple, rapid technique using few and simple instruments.

Bossi thinks rubber gloves useful in certain cases, but deprecates their general use because they lessen tactile sensibility and may create a belief that accurate disinfection of the hands can be dispensed with.

GEORGE DE TARNOWSKY.

A Case of Opening of a Supernumerary Ureter into the Vulva Cured by Resection of the Kidney (Ein Fall von Auswündung eines überzähliger Ureters in die Vulva, durch Nierenresection geheilt). C. D. JOSEPHSON. *Nordiskt Med. Arkiv.*, 1908, bd. xli, afd. i, h. 4.

Josephson reports a case of supernumerary ureter of left kidney, opening just to the left and below the urethral orifice in a girl of eighteen years, which he had first seen ten years previously, and had then advised to wait until later for operation. In making his diagnosis he employed the ordinary means of ureteral catheterization, etc., without appreciable result. He then injected methylene blue solution through the urethral catheter without the appearance of blue in the urine flowing from the supernumerary orifice, although this was discolored when the drug was given per oram.

He discusses in detail the treatment of this condition and states that so far as he is able to find out his is the only case on record treated by resection. His reason for performing this operation was that the pelvis drain into the supernumerary ureter was so large as to leave practically no pelvis for the ureter emptying into the bladder. He advises the same operation where the pelvis of the supernumerary ureter is infected, and sometimes when the opening is high up in the vagina.

C. G. GRULEE.

Statics of Pelvic Viscera. G. A. CASALIS. *Journal of Obst. and Gyn. of the British Empire*, October and November, 1909.

Casalis undertakes a study of this theme from an academic viewpoint, part I taking up anatomical and physiological considerations, part II those of a pathological and therapeutical nature. After going into the subject with minute detail, he formulates the following: —

1. The pelvic viscera are both suspended and supported organs.

2. The "pelvic floor" forms one solid mass separating the pelvic cavity from the exterior, just as the anterior abdominal wall separates the abdominal cavity from the exterior.

3. It includes part of the viscera, as well as the so-called ligaments of the uterus, of which they are an integral part.

4. Relaxation of part or the whole of this fibromuscular, cellular, vascular and peritoneal diaphragm results in the production of the different forms of pelvic displacements.

5. Relaxation of the upper pelvic segment leads to retrodeviations and partial uterine descent; that of the lower to cystocele, colpocele and rectocele; relaxation of the upper and lower segments to classical prolapse. The intensification of the combined con-

ditions is productive of hernia of the pelvic contents, or total prolapse.

6. Relaxation of the upper pelvic segment is curable by the so-called round ligament operations of which Alexander's and Simpson's are the best types. Descensus uteri, especially in middle-aged women, demands ventrofixation combined with plastic operations on the vagina and perineum.

7. Prolapse should always be operated upon. Classical prolapse, by a combined anterior and posterior colpoperineorrhaphy, with union of the paravaginal tissues in the middle line, and a myorrhaphy of the levator ani and frequently also in addition a ventrofixation; cystocele and rectocele by the combined perineal and vaginal plastic operations.

8. Hernia of the pelvic contents justifies all these preceding operations, but may best be treated by vaginal or abdominal hysterectomy with suture in the middle line, and if possible to the abdominal incision of the overstretched perivascular sheaths. In extreme cases, the interposition operation may be tried, or when everything else fails, P. Muller's excision of the whole vaginal canal. CAREY CULBERTSON.

Hypernephroid Tumors Primarily Located in the Female Genitaliæ (Ueber im weiblichen Genitale primär entstandene hypernephroide Geschwülste). EMIL BOVIN. *Nordiskt Med. Arkiv.*, 1908, bd. xli, afd. i, h. 4.

After a thorough review of the literature of this subject Bovin reports a case of hypernephroid tumor involving the left ovary in a married woman of 28 years. Tumor was removed and the patient was well a year and a half after the operation. The clinical and pathological reports as well as the extracts from the literature are very complete. C. G. GRULEE.

A Contribution to the Knowledge of Actinomycosis of the Female Genital Organs (Beitrage zur Kenntnis der Aktinomycose der weiblichen Geschlechts organe). HAMM AND KELLER. *Beitr. z. Geb. und Gyn.*, b. xiv, h. 2.

The apparent rarity of actinomycosis of the female genital organs lies in the fact that its macroscopical changes are not so striking as to make readily a gross anatomical diagnosis; certainly a number of cases of actinomycosis are found under the diagnosis of chronic inflammatory tumors of the tubes and ovaries or of tuberculosis. Only a microscopical, bacterial, and cultural examination could clear these cases up. Bollinger's statement, now disproved, that the macroscopical, visible "corpora flava" are indispensable to the diagnosis, led to many errors. The authors collected twenty-two cases in the literature and added one very interesting case, the somewhat elaborate description of which seems to me important on account of the close resemblance of this case to tuberculosis; two processes which were certainly often confused.

A married woman, thirty-four years old, complained in June, 1901, of pain in the abdomen. Bilateral tumors of the tube and ovary were found and a conservative treatment advised. The woman improved, but in November an operation became necessary, and according to the record, both tubercular tubes, the right ovary and part of the left were extirpated. A fistula remained and on account of this and constant pain she was operated upon again in 1908. Besides the fistula an abscess was found in the pelvis containing pus and detritus. The abscess was removed and drainage established through the vagina. One week after the laparotomy the patient died.

The macroscopical, pathological, and anatomical diagnosis was: Tuberculosis obsoleta glandularum lymphaticarum peribronch. Parametritis chronica ichorosa, peritonitis purulenta. The soft, fluctuating tumor removed during the operation consisted of granulations and was filled with detritus. Microscopically the wall showed granulation-tissue in different stages of development and degeneration with many lymphomæ in it, the centers of which were often caseous. The number of giant cells was large. These histological pictures would have justified a diagnosis of tuberculosis, but the bacteriological examination and an exact test by cultures revealed the case to be an actinomycosis. First, the pus of the tumor showed acid fast grown position positive bacilli and cocci arranged in long chains; no sulphur granules were visible. Ærobic cultures of the pus in two per cent glycerine bouillon showed colonies with a distinct radiating structure, so did the anærobic cultures in the same medium. Upon agar-agara isolated colonies of a residue grew. Gelatine was not liquified. All the colonies showed shorter and longer bacilli; their ends slightly club-shaped, resembling pseudo-diphtheria; besides them long threads — "fadennetze" — were present. Paraffin sections of the wall of the tumor show bacilli nd chains of cocci. The bacilli are somewhat larger and thicker than tubercle bacilli; otherwise, morphologically identical.

Animal experiments: Two guinea pigs were inoculated with pus, and miliary nodules were found in the peritoneal cavity and, again, the bacilli above described. The changes in the organs of the infected animals were similar to pseudo tuberculosis, many miliary nodules like tubercular nodules, but there were no giant cells present. This latter finding is the rule in inoculated actinomycosis. Morphologically important is the tendency of this fungus to grow into long threads and chains which could easily be confused with streptococci. This peculiarity gave rise to the name "streptotrichea" for this group. The authors have come to the conclusion that the presence of "corpora flava Drusen" is not necessary for the diagnosis of actinomycosis, that the bacilli found are the connecting link between tuberculosis and actinomycosis. The differences with the tubercle bacilli are: 1, the size; 2, its growth upon nearly all nutrient media; the difference from actinomycosis Boström is the fact that its does not liquify gelatine, the difference from actinomycosis Israel, that it grows ærobe. For an exact diagnosis we can only depend upon an exact bacteriological and cultural examination. HELIODOR SCHILLER.

Fibromyomata Uteri. ELLICE MCDONALD, M. D. *Journal of Obstetrics and Gynæcology of the British Empire*, August, 1909.

McDonald gives an interesting series of tables based upon his further study of uterine fibromyomata. These tables include most of 700 cases, 280 of which were reported by the writer in 1904, the series also including 26 cases in which myomata were found at autopsy.

Character	Number	Percentage
Single	238	34
Multiple	462	66
Small	257	36.7
Medium	209	29.8
Large	234	33.5
Subserous	136	19.5
Interstitial	190	27.1
Submucous	75	10.7
Combined	299	42.7

Degenerations	Number	Percentage
Cyaline	127	18
Calcareous	65	9
Cystic	20	3
Hæmorrhagic	14	2
Necrotic	57	8
Adenomyoma	23	3
with Adenocarcinoma	20	2.9
with Carcinoma cervicis	6	0.8
Sarcoma	7	1.
with Chorioepithelioma	2	0.3
Total Malignancy	35	5

Complications	Number	Percentage
Ovarian Cysts	53	7.5
Cystic Ovaries	141	20
Ovarian Fibroma	8	1
Ovarian Carcinoma	5	0.7
Salpingitis	194	27.5
Appendicitis	148	21

Age	Number	Percentage
20–30 years	19	2.7
30–40 "	233	33
40–50 "	332	47.6
50–60 "	95	13
60–70 "	21	3

"In consideration of malignancy alone it is probable that malignant changes will result in one case in every twenty between the ages of 40 and 50, one case in every eight between the ages of 50 and 60, and one case in every four between the ages of 60 and 70."

In his summary McDonald makes the following points:

1. The menopause does not bring a cure to fibroids; on the contrary, increasing age increases the danger from these growths.

2. There is little danger of malignancy arising in fibroids before 40 years of age, after which time the danger increases with each year.

3. In view of the sarcomatous changes, carcinomatous associations, and other degenerations of uterine fibromyomata, early removal is indicated when they are of sufficient size to produce symptoms and cause the patient to seek advice. Small uncomplicated fibroids in young women do not require early treatment.

4. Thorough pathological examination should be made of all fibroids for evidence of malignancy. The tumor should be opened at the time of operation and examined for adenocarcinoma or sarcoma. Particular study should be devoted to those tumors which are necrotic, cystic, or both, as among these are found the largest proportion of malignant changes.

5. In view of the large percentage of inflammatory changes in the Fallopian tubes and appendix these should be examined at the time of operation and removed, if diseased. CAREY CULBERTSON.

The Significance of Glandular Hyperplasia and Hypertrophy of the Endometrium (Zur Bedentung der Glandulären Hyperplasie und Hypertophie des Endometriums). HIMMELHEBER. *Monatsch. f. Geburts. und Gyn.*, b. xxx, h. 2.

Contrary to the statement of Hitschman and Adler and others, that the so-called endometritis glandularis hyperplastica and hypertrophica are not pathologic but simple, physiologic conditions, produced by normal, cyclic, premenstrual changes in the mucosa of the uterus, Himmelheber derives, through very exact histologic and clinical examinations, the following conclusion:

The glands of the endometrium vary physiologically so much in form and number, depending on the menstruation, that it is often very difficult to distinguish between normal and pathologic conditions.

But next to these physiologic variations there exists a real glandular hyperplasia and hypertrophy. We are justified to diagnose it:

1. If there exists clinically an abnormal secretion *a*, with cystic formations in the glands; *b*, with a progressive process in the glands; *c*, with premenstrual formation of glands during the interval of two menstruations.

2. The presence of a great number of spindle cells and newly formed connective tissue.

3. If we find a true glandular hypertrophy and hyperplasia in connection with inflammatory conditions and residua of it in the stroma.

HELIODOR SCHILLER.

BOOK REVIEWS

SURGICAL DIAGNOSIS. By Edward Martin, M. D. Philadelphia: Lea & Febiger, 1909.

It is extremely difficult for an author to prepare a book which will meet the needs of the general practitioner, the specialist, and the student. Those volumes designed for didactic courses are hardly suitable for those who understood the principles of surgery, and consequently desire a discussion of the subject entirely different from that which appeals to the student. The volume of Martin appeals to one as a categorical discussion, and the diagnostic points which pertain to each individual pathological condition are given concisely, and in so far the book is admirably adapted for the use of the student. However, except the chapter upon the "Diseases of the Abdomen," one misses the clinical groupings that are met in ordinary practice.

These remarks are not made in the spirit of criticism but simply that the reader may understand the scope of the volume and not be disappointed when he misses this phase of surgical diagnosis which is such an excellent part of such treatises as "Albert's Diagnosis," and others.

The chapter by Weisenburg upon "Diseases of the Nervous System" is admirably written, and is a concise discussion in relation to diseases of this system.

The volume is one of nearly 800 pages, and covers the entire field of surgery. The sections upon fractures will be found to be particularly satisfactory.

A MANUAL OF OPERATIVE SURGERY. By Sir Frederick Treves, F.R.C.S., and Jonathan Hutchinson, F.R.C.S. Philadelphia and New York: Lea & Febiger, 1909.

The third edition of this classical work with a thorough revision by Jonathan Hutchinson presents an up-to-date, comprehensive work on operative surgery that has maintained a first place in surgical literature since its first issue in 1891. Jonathan Hutchinson, the reviser, says:

"The ever-growing importance of abdominal surgery rendered it advisable that the operations on the abdomen should be grouped together in the first volume. Some sections have been curtailed or omitted, such as that relating to lateral lithotomy, but most of them have been added to, and several are wholly new. A considerable number of fresh illustrations have been inserted, and a series of colored plates has been introduced to make clearer the anatomy of certain important operations. These colored plates have all been drawn specially for this edition from dissections in the museums of the Royal College of Surgeons and the London Hospital Medical College. I beg to thank the councils of those institutions for their kindness and courtesy in this matter.

"So far as present surgical experience goes I have selected for description the best methods of performing the various operations, but I have endeavored to avoid encumbering the work with foot-notes and details as to the exact forms of incision, etc., employed by many individual surgeons. Both surgery and medicine, I venture to think, have been greatly hampered in the past by the needless introduction of names.

"The sections on ovariotomy and hysterectomy have been revised by Dr. H. Russell Andrews, those referring to renal and vesical operations have been revised and extensively altered by Mr. F. S. Kidd and myself, the section dealing with operations on the rectum have been revised and largely rewritten by Mr. A. J. Walton. To those gentlemen I am sincerely grateful for their help."

By comparing this with the first and second editions, which are now out of print, it will be seen that the additions and alterations have really resulted in the formation of a new work while, as the author states, everything of permanent value in previous editions has been retained.

The work is of unusually artistic appearance, showing a high order of book making.

TUMORS OF THE KIDNEY. By Edgar Garceau, M. D. New York and London: D. Appleton & Company, 1909.

The Appleton Company should be congratulated upon this last addition to their series of monographs upon various subjects. The volume by Garceau comprises over 400 pages and discusses in a most satisfactory manner the subjects of renal, ureteral, perirenal, and adrenal tumors, and in addition, actinomycosis and echinococcus of the kidney.

The author offers a new classification of solid tumors of the renal parenchyma, which answers admirably for a discussion of the subject, and would seem to have a sound pathological basis. He has been able to use the pathological material from the surgical laboratory of the Massachusetts General Hospital, and thus has been enabled to add to the statistics from other authors a firm basis for the discussion of the subject.

Justly the author has given a considerable space to the subject of hypernephroma, which has not, up to the present time, received the attention that it should in American surgical literature. He has classified 176 cases from the literature. The discussion is ample and satisfactory.

The subjects of sarcoma and carcinoma have been relegated to second place, but it is yet entirely adequate. This holds true also of the discussion of

the embryonic tumors, as he chooses to classify them, and also the discussion of tumors of the pelvis and ureter and cysts.

A final chapter is given to the determination of the renal efficiency. For the matter of separation of the urine, the author is in favor of Luy's instrument, but discusses briefly the use of the catheterising cystoscopes and the technique of their use. The various tests for determining the functional activity of the two kidneys, the phloridzin test, cryoscopy, the methylene blue test, and Albarren's polyuria test are discussed briefly. In every way the author should be congratulated upon this addition to modern surgery, it being not so concise as to leave much desired, nor so complete as to bury the essential facts.

SURGICAL DIAGNOSIS. By Alexander Bryan Johnson, M. D. New York and London: D. Appleton & Company, 1909.

This work, which the author states embodies, to some extent, impressions gained during an experience extending over a period of twenty-five years spent in the surgical wards of three hospitals in the city of New York, viz.: Bellevue, Roosevelt, and the New York Hospital, is one that has the appearance of being laid on a broad foundation, and consisting of three good sized volumes, is unusually comprehensive.

The author states that he has attempted to treat the subject of surgical diagnosis upon fairly broad lines, and is of the opinion that the practical value of such a treatise would be increased if in addition to the description of methods of examination and the relation of signs and symptoms, there were added some pathological data of illustrative cases. In carrying out this idea he has succeeded in giving to the medical profession a book which will be at once a help to those who desire to study the subject of surgical diagnosis as well as a direct aid to physicians and surgeons in arriving at a correct diagnosis in individual cases.

In preparing the work, the author has constantly in mind the needs of the practitioner in general medicine, and it is to him especially that this work will be found valuable. He has been aided in the preparation of the work by the use of illustrations furnished by Dr. Francis S. Watson of Boston; Dr. George Woolsey, Dr. Pearce Bailey, Dr. M. A. Starr, Dr. F. T. Brown, and Dr. Frank Hartley, of New York; Dr. Harvey Cushing and Dr. Howard Kelly of Baltimore.

The books are unusually attractive, well printed, and illustrated.

The first volume contains chapters on: Wounds and Their Diseases; Diseases of the Soft Parts and of the Bones; Fractures and Dislocations; Tumors; Syphilis; the X-rays; The Head and Neck; Thorax and Breast; The Abdomen in General; The Peritoneum and Injuries of Special Abdominal Organs.

The second volume covers the following subjects: Injuries and Diseases of the Abdomen and of its Contained Viscera; The Rectum; Injuries and Diseases of the Kidneys, The Bladder, The Prostate, The Urethra, Penis, Seminal Vesicles, Scrotum, Testis and Spermatic Cord.

The third volume includes: The Spine; The Nerves; The Pelvis; The Extremities; The Appendix.

ANATOMIE CLINIQUE ET TECHNIQUE OPERATOIRE. By Professor Dr. O. Laurent. Second edition. Brussels: Etablissements Emile Bruylant; Paris: Octave Doin.

The modern development of surgery along the lines of technique and pathology has tended in a way to distract the student from the essential anatomical principles which must underlie all probable surgical procedures. This volume of Laurent is one that can be recommended to the student of surgery. It comprises nearly 1,000 pages of clearly written, concise, yet satisfactory discussions of the surgical procedures in their relation to anatomy. The first thirty-four pages, consumed by the discussion of operations in general, is well written. This is followed by a discussion of regional surgery, covering in a satisfactory manner the various surgical affections, and is discussed with the anatomy of the part constantly in mind.

The American misses some of those procedures in which we have taken particular pride and which have given us particular satisfaction, as, for instance, the Matas' operation. For the most part, however, the work is complete.

One will be particularly pleased with the chapters upon cranial topography and surgery of the nervous system, and also the osseous system. Fortunately, for the reader, the author combines his own clinical experience with a careful review of surgery and anatomy so that the work taken as a whole may be regarded as one of the best exponents of this phase of surgical literature that the profession of Europe and America has welcomed within recent years.

OBSTETRICS. By David James Evans, M. D. Second edition. Philadelphia and New York: Lea & Febiger, 1909.

This second edition of Evans' text-book is a slight amplification of the former volume. Accouchement forcé has been discussed along with the newer obstetrical operations. As those who are familiar with the book know, it deals in a concise though clear manner with the normal and pathological states met with in obstetrical practice. Although a book of text-book character, it will still be found a ready reference for the general practitioner.

PRACTICAL MEDICINE SERIES. Vol. III. Pediatrics and Orthopedics. By I. A. Abt, M. D., and J. Ridlon, A. M., M. D. Chicago: The Year Book Publishers, 1909.

This small volume contains a very complete review of all the important work done in the two subjects mentioned. The orthopedic section contains long abstracts of articles on congenital dislocation of the hip and tendon transplantation, as well as a review of the literature on fractures. C. G. GRULEE.